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AFFAIRS OF THE AMERICAN SHIP BUILDING CO.

On the subject of earnings, which is a matter of first importance, no information was given out after the annual meeting of the American Ship Building Co., which was held in New Jersey on Wednesday of this week. A financial statement will very probably be furnished to the stockholders later on. In the absence of an official statement it is probably as well not to repeat rumors regarding earnings, but it may be said upon the best of authority that the company has a surplus amply sufficient to begin the payment of common stock dividends. Certain leading stockholders are of the opinion, however, that a surplus beyond all question of operating expenses for a long time to come—the kind of surplus that would do away entirely with the borrowing of money while vessels are under construction—should be built up before common stock dividends are begun. The question will be definitely settled at the next meeting of the board. The only change in officers was the election of Mr. A. B. Wolvin, president of the West Superior company, to succeed the late W. E. Fitzgerald on the executive committee. Mr. Fitzgerald was also assistant general manager of the company, but that place will be left vacant. Directors and officers for the ensuing year are:

Directors—William L. Brown, H. H. Porter, Jr., of Chicago; Robert Wallace, H. M. Hanna, Robert L. Ireland, James C. Wallace, L. C. Hanna, Luther Allen of Cleveland; Alexander McVittie, W. C. McMillan of Detroit; J. A. McGean, New York; L. M. Bowers, Binghamton, N. Y., A. B. Wolvin, Duluth; Andrew M. Joys, Milwaukee; W. T. Coleman Carpenter, East Orange, N. J.

Executive committee—Luther Allen, A. B. Wolvin, Robert L. Ireland, William L. Brown, L. M. Bowers, Alexander McVittie, James C. Wallace.

Officers—William L. Brown, president; Robert L. Ireland, vice-president; Russell C. Wetmore, secretary and treasurer; James C. Wallace, general manager.

The capital stock of the company is as it was a year ago, namely, $15,000,000 of preferred and $15,000,000 of common authorized, with $7,900,000 of preferred stock issued and $7,600,000 of common stock issued. Regular quarterly dividends of 1¾ per cent. have been paid on the preferred stock since the organization of the company. All of the property and interests of the company are free from mortgage or incumbrance of every kind, excepting $150,000 purchase mortgage on the Buffalo plant. During the year the company has acquired by purchase, without increasing its capital stock, the two dry docks, construction plant, machine shops, etc., of the Union Dry Dock of Buffalo, and leased the real estate with option to purchase on terms favorable to the company.

During the year the company built forty steel vessels, 191,000 net tons carrying capacity, and they now have under construction twenty-one vessels of 93,500 tons capacity. The capacity is based on 18-ft. draught.

WORK DONE DURING YEAR ENDED JULY 1 AND NOW UNDER CONSTRUCTION AT SHIP YARDS OF THE AMERICAN SHIP BUILDING CO.

Plants.	Vessels built.	Carrying capacity, net tons.	Vessels under construction.	Carrying capacity, net tons.	Vessels docked for repairs.
Detroit	6	35,000	6	16,000	116
Lorain	8	36,000	5	25,000	34
Cleveland	5	24,000	5	25,000	219
Bay City	4	15,000			
Chicago	8	42,000	2	15,000	29
West Superior	5	24,000	1	6,500	69
Milwaukee	1	2,000			187
Buffalo	3	13,000	2	6,000	193

The number of vessels docked for repairs during the year was 847. Referring to the prospects of the company President W. L. Brown says in the annual report:

"In the previous annual report reference was made to possibilities of construction for salt water service, and it is gratifying to report that during the past twelve months contacts have been secured for the construction of eleven vessels suitable for this service. Four of these are now engaged in transatlantic trade, and the others, so far as completed, are equipped and prepared for salt water—coast and transatlantic work—one being now on the way to San Francisco, and while this business is yet largely in an experimental condition, your president has reason to believe that other work of like character will be secured. The time has come when combined and united effort should be made in the entire great lakes region, looking to the construction, maintenance and operation of ample waterways from the lakes to salt water, and it is to be hoped that agitation and legislation on the subject will be promptly taken and followed up energetically until the desired result is attained. It seems unnecessary to dwell on this subject in a report of this character, except to call the attention of the stockholders of this company to the importance of the question and to suggest their co-operation in bringing the subject before the public."

President Brown also pays this tribute to the late W. E. Fitzgerald: "Since this report was written the company has lost by accidental death its assistant general manager and director William E. Fitzgerald, who was also president of the Milwaukee Dry Dock Co. No words of mine can adequately express what the officers of this company and his associates feel in this loss. Always bright, active and energetic, he gave the affairs of the company his best efforts and no greater tribute can be paid to his memory than to say that he was, in the highest sense of the word, a man."

The battleship Maine will be launched very quietly at Cramp's, Philadelphia, on Saturday. There have been several announcements of the launch of this battleship but unforeseen delays have occurred. Miss Mary Preble Anderson of Portland, Me., has been selected to christen the vessel.

DECLINE IN HARD COAL SHIPMENTS BY LAKE.

One branch of lake business that does not grow is the movement of anthracite coal westward from Buffalo. Attention was directed to this subject by one of the regular dispatches in the daily papers, a few days ago, showing vessel clearances from Buffalo. Three out of four cargoes of coal cleared in a day were in railroad line boats, so that in so far as it affects lake carriers in general that much coal might as well have been added to the rail shipments. The Review has taken pains to look into the shipments of hard coal from Buffalo for a long period of years past, and a table presented herewith shows very clearly that the lake business has been declining since 1888, although the amount of hard coal used in the west and northwest has, of course, increased immensely of late years. The railroads are carrying it, especially to Chicago and the districts tributary to that city. It will be noted in glancing over the table that the lake shipments were unusually large in 1899. This was due to the fact that in that year the railroads all over the country found business largely in excess of their capacity and cars could not be spared to haul coal from Buffalo west.

HARD COAL SHIPMENTS FROM BUFFALO.

Year.	Tons.	Year.	Tons.
1873	570,440	1887	1,904,060
1874	384,500	1888	2,556,270
1875	439,730	1889	2,156,670
1876	361,480	1890	2,044,134
1877	455,070	1891	2,365,895
1878	331,170	1892	2,852,330
1879	580,640	1893	2,703,673
1880	589,670	1894	2,485,255
1881	825,240	1895	2,688,076
1882	1,027,500	1896	2,242,326
1883	1,467,778	1897	2,688,076
1884	1,305,410	1898	2,331,199
1885	1,506,000	1899	2,808,898
1886	1,562,060	1900	1,937,811

STEAMER MIDLAND QUEEN.

James Playfair of Midland, Ont., will in a few days have on the great lakes a steel steamer of Canadian canal dimensions that will compare favorably with the best ships of that type now in service. The vessel was built by the Caledon Ship Building & Engineering Co., Ltd., Dundee, Scotland, through the agency of Wm. Peterson, Ltd., of Montreal and Newcastle-on-Tyne. She is named Midland Queen and is 225 ft. long, 42 ft. 6 in. beam and 23 ft. 8 in. depth. She has been given the highest class in the British Corporation Registry. Ample accommodation, fitted up in the most comfortable style, has been provided for owners, officers and crew, as well as provision for a few passengers. There are two steel deck houses amidship, as well as a large house aft, containing dining room, steward's quarters and staterooms. Engines are of triple expansion type, with cylinders of 18, 30 and 50 in. diameter and 36 in. stroke. Steam is supplied by two Scotch boilers at 170 lbs. pressure. During construction the vessel and machinery were superintended, on behalf of the owner, by Capt. Fetherstonehaugh of Toronto, and Mr. F. Piercy, superintendent engineer to Wm. Peterson, Ltd. The Midland Queen is expected to arrive in Montreal about August 10.

HYACINTH-MINERVA BOILER TRIALS.

The race of the British cruisers Hyacinth and Minerva, fitted with Belleville water tube and Scotch boilers, respectively, from Gibraltar to Spithead has been completed, though it is unsatisfactory because it is not conclusive. The Minerva arrived at Spithead fully an hour and a half ahead of the Hyacinth but both vessels encountered three fog banks and had to grope their way for twenty hours. The Minerva occupied 75½ hours in covering 1,160 miles. Her average speed when not delayed by fog was 18.67 knots and the Hyacinth's about 18 knots. On leaving Gibraltar the Hyacinth's boilers justified the claim made for them of superior quickness in attaining full power, thus enabling her to get a good lead, but the Minerva speedily overhauled her, but whether this was attributable to good fortune in running through the fog is yet to be ascertained. The Minerva had no trouble throughout the voyage except a slight overheating of the bearings which was soon remedied; the Hyacinth, however, while running up the channel split one of her boiler tubes and severely scalded a stoker.

Three dredges are at work on the canal to be built at the plant of the Lackawanna Iron & Steel Co., at Stony Point, Buffalo. The canal will run almost the entire length of the property and docks will be built along its banks for the unloading of ore for the blast furnaces. Vessels will come in through the harbor and will pass out through the canal into the lake without being compelled to turn around. Three blast furnaces are now under construction and will be completed within the next six months. The structural work for the forge shop is nearly completed, while the machine shop and boiler house are entirely completed and already equipped with machinery.

The navy department has purchased the great floating steel drydock which lies in Havana harbor from the government of Spain for $185,000. The negotiations for the purchase of the dry dock were closed last week by Lucien Young of the port of Havana. The original price asked by the Spanish was $250,000. Rear Admiral Bowles, chief constructor of the navy, wants the dry dock towed to the Philippines. He thinks that this can readily be done. The British recently towed a big dry dock to Bermuda.

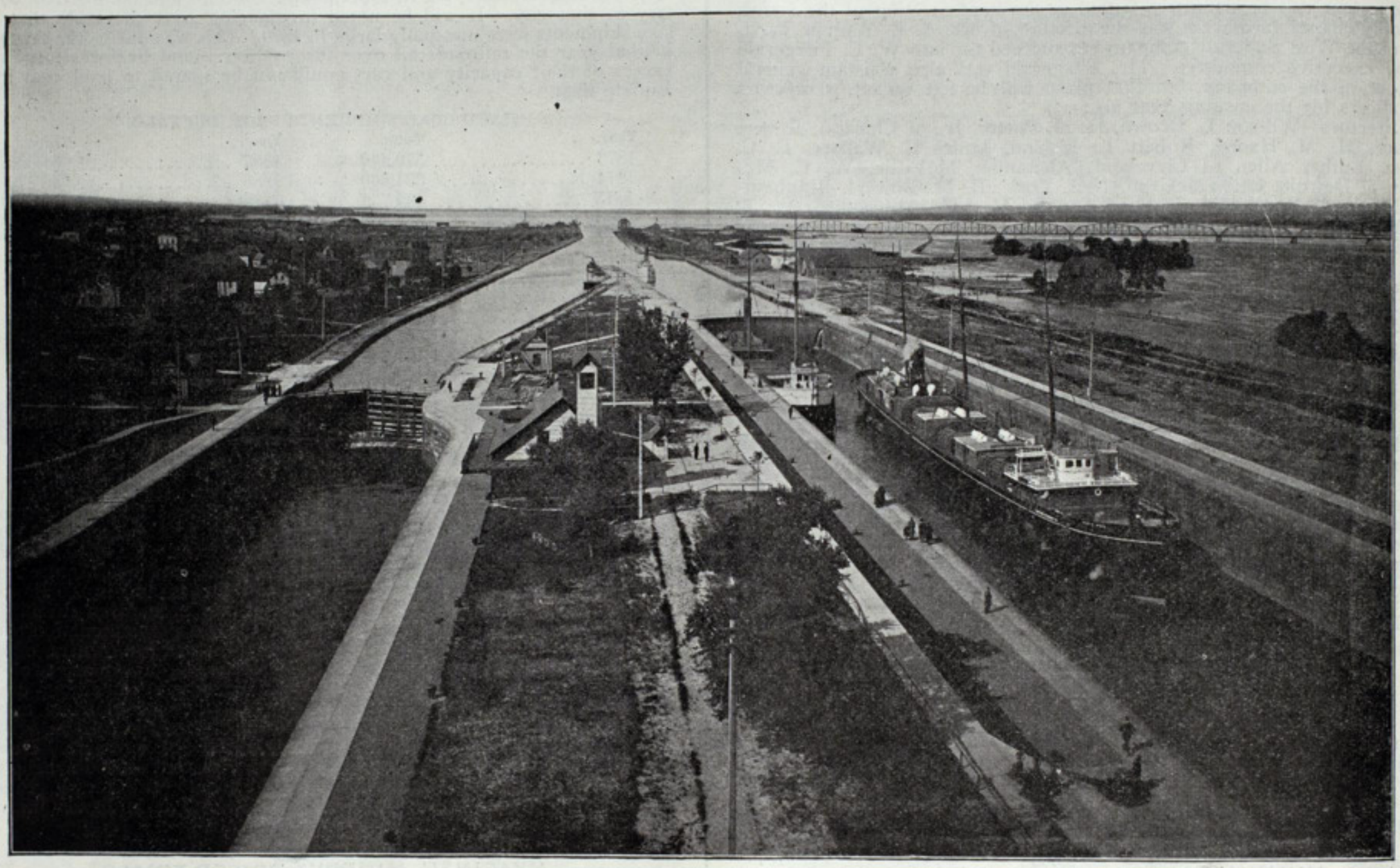
MAY BE A DOUBLE LAUNCHING AT NEWPORT NEWS.

[Special correspondence to the Marine Review.]

Newport News, Va., July 24.—The next big launching at the ship yard will occur about Sept. 1, and it will be a double event in all probability. The ships, which will be sent overboard within a half hour of each other, will be the Pacific Mail line steamship Siberia, sister of the Korea, and the Morgan line steamship El Siglo. Both of these ships could have been launched several weeks ago, but the machinists' strike interfered. Now that the differences between the company and its employes have been satisfactorily adjusted, work on all of the contracts will be rushed to completion as rapidly as possible, in order to make up for lost time. About all of the old men have returned to work and hundreds of new men have been employed. The force today is about as large as it was just prior to the strike, but more skilled men are needed and all who apply for work will be taken on. In order to advance all of the ships as far as possible the Siberia and El Siglo will be launched on the same day, making room for new keels. It has not been definitely decided that both ships will go down the ways on the same day, but there is hardly any doubt of it. The Siberia has a displacement of 18,600 tons and El Siglo of 6,000 tons. The business men will probably arrange to have excursions run here from all over the state on the day of the launching, making this event similar to if not greater than the notable launching of the Korea in March, when probably 25,000 people saw the largest ship ever built on this continent go overboard. Both ships are unusually far advanced, and their completion, after taking the water, will be a matter of only a short time.

The next ship launched will be El Libre, for the Morgan line, making the twelfth large steamship built for that company by the Newport News company. The first four ships built for the Morgan fleet were El Norte, El Sud, El Rio and El Cid. During the Spanish-American war they were sold to the government at high figures, now being in service as the Yankee (El Norte), the Dixie (El Rio), and the Buffalo (El Cid). The Yosemite (El Sud) went down recently in the Guam typhoon, being the only vessel ever built by the Newport News company which is not afloat today and giving splendid service. After the sale of these ships, the Morgan line contracted for four more, which took the names of the first quartet. Of the third quartet, one, El Valle, is in service; the second, El Dia, will go into service in a few weeks; El Siglo will be launched about Sept. 1, and El Libre will follow shortly after. Whether or not the Morgan line contemplates building any more ships is not known. With the delivery of El Libre it will have eight new freighters in service. All of the vessels of the Chesapeake & Ohio Railway's local fleet have just been overhauled at the ship yard for the summer and winter, including the steamer Louise, the tugs Alice, Helen, Hinton, Wanderer and James Smith, Jr., and the several large floats.

The new steamer Virginia, which is building at the works of Wm. R. Trigg Co., Richmond, for the Chesapeake & Ohio's route between Newport News and Norfolk, will be launched next month and will be in service probably by the middle of September, if not sooner. It will be a fast vessel, being able to make the trip across Hampton Roads to Norfolk in forty minutes, where one hour is consumed now. The Hudson river steamer Belle Horton, which was purchased by the Norfolk & Atlantic Terminal Co., for its line between Ivy avenue, on this side of Hampton Roads, and Norfolk-on-the-Roads, on the other, is giving good service. She was brought to Newport News from New York and overhauled from stem to stern at the ship yard, the work costing about $20,000. An excursion deck was added forward. The Old Dominion Steamship Co. expects to have its two new passenger steamers ready for the James river route in September. These will be night boats and will inaugurate a new feature in travel between Newport News, Norfolk and Richmond, patrons of the line being able to make the trip nightly without loss of time from work.



View of United States locks and canal at Sault Ste. Marie.

Lake Superior in the distance and the Rapids of St. Mary's river to the right.

Power house at lower end of locks not shown in the picture, as view was taken from that point.

LIGHT-SHIP ON THE GAS BUOY PRINCIPLE.

Messrs. D. & C. Stevenson of Edinburgh, engineers, have evolved for the northern British light-house commissioners a light-ship which is likely to have a revolutionary tendency on the design of light-ships. Messrs. Pintsch of London, the well-known lighting engineers, have assisted the Stevensons in the design and have elaborated their compound gas system in order to do away with the necessity for the maintenance of a crew on board the vessel. The vessel was built by the Clyde Ship Building & Engineering Co., Port Glasgow, and is to be stationed at the Otter rock on the west coast of Scotland where it will be subjected to great stress of weather. The hull is built of steel of extra strength, with fin and web keels 3 ft. in depth, which, taken along with the extreme beam of hull, should reduce rolling to a minimum. Two steel watertight bulkheads are fitted, dividing the vessel into three watertight compartments. In the center division are placed two large welded steel gas holders, which have capacity for enough gas at pressure to last the vessel for several months. At the top of a circular tower or mast is placed the lantern, at a height of 25 ft. from the water level. To guard against fog a large bell is hung in a belfry attached to the deck of the vessel and by a special arrangement the gas passing from holders to lantern is made to actuate a clapper, which rings the bell automatically, an ordinary tongue being also provided and actuated by the roll of the vessel. As a result of these special features the light-ship on being moored at her station will be independent of outside attention for a considerable length of time and has everything on board to render her a self-acting light-ship and bell buoy.

Notwithstanding the fact that the British admiralty is building five submarine boats the tendency of the English is to make sport of this type of craft. The current issue of Engineer of London contains the following note: "The problem of submarine navigation has been solved again. This time it is in France, where a new boat has been evolved that is going to revolutionize submarine warfare. In view of the fact that, judging by the Narval's trials, milk seems the prime necessity in a submarine, someone has suggested that the new boat is designed to carry a cow! Joking apart, the last reports of the Gustave Zédé abundantly prove that the art of living under water is very imperfectly acquired as yet. Nothing is easier than to design a boat that will immerse ad lib—the problem is to find asphyxiation-proof people to exist inside her. That little item sanguine inventors seem to have quite overlooked."

CANADIAN MARITIME NOTES.

There are persistent rumors that the Niagara Navigation Co. is to be absorbed by the Richelieu & Ontario Navigation Co. The company is capitalized at $1,000,000, of which $605,000 is paid up. The company enjoys a large business between Toronto, Niagara-on-the-lake, Queenstown and Lewiston, and owns the steamers Chicora, Cibola, Chippewa, Corona and Ongiara. The company's operations have been very satisfactory and it has paid regular 6 per cent dividends.

The Northern Navigation Co. of Ontario recently offered for subscription $238,000 of stock at 105, which was immediately subscribed. The issue is for the purpose of paying for new steamers and for securing a controlling interest in the Northwest Transportation Co. The steamers owned by the company are the Atlantic, Germanic, City of Collingwood, City of Midland, City of Toronto, Majestic and Brittanic. The company does a general passenger and freight business on Georgian bay.

The coal trade between Cape Breton and Montreal is carried on almost exclusively by Norwegian steamers to the exclusion of Canadian and English vessels. This is due, it is claimed, to the low rates of insurance charged by Norwegian companies who discount the reported dangers of the route.

The Imperial Dry Dock Co., St. John, N. B., is understood to have received assurances from the minister of railways and other ministers of the Dominion government that sufficient aid will be forthcoming from the government to insure the construction of a dry dock at St. John. It is also stated that the company has obtained another important concession and that the existing ship building plant will proceed hand-in-hand with the dry dock. It is understood that the government has consented to aid the dry dock to the extent of 2 per cent yearly for twenty years on the total cost, which will be $750,000.

The car ferry steamer for the Intercolonial Railway, to run between Mulgrave and Point Tupper on the Strait of Canso, has been launched in England on the Tyne. The dimensions are: Length, 282 ft.; breadth, 48 ft.; depth, 17 ft. There are three tracks on the deck of the vessel, and they are so arranged that the trains can enter at one end and leave it at the other. The swinging of the vessel at each end is obviated by this arrangement, and she is ready to receive the second train as soon as she has discharged the first.

A dredge being built for the Dominion government for use on the Fraser river was launched recently at Westminster, B. C. The frame work was built by the Polson Iron Works, Toronto, Ont., and shipped across the continent. The main deck will be wholly occupied by boilers, engines and pumping machinery. The pumping machinery is powerful, triple expansion with cylinders 13½, 22 and 36 in. by 22 in. The suction pump, which will excavate the mud from the river bottom, will be 20 in. in diameter.

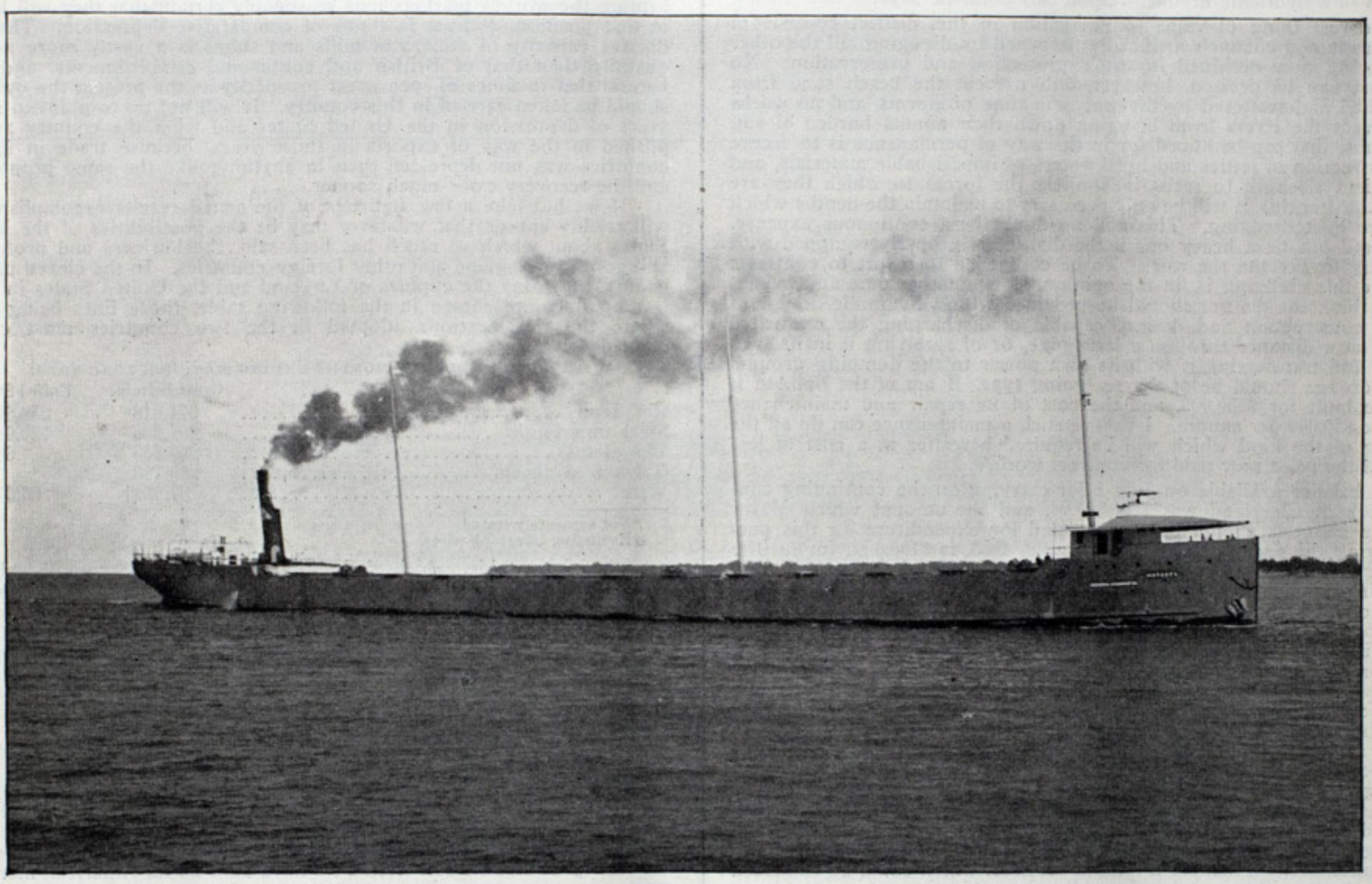
The cruiser Newark, which has just returned from the Asiatic station, will be rebuilt at the Brooklyn navy yard. She will be completely stripped, will receive new machinery and internal fittings, and altogether about $500,000 will be spent upon her.

The Adder, the first of the new submarine boats, was launched at Lewis Nixon's ship yard, Elizabethport, N. J., on Monday.

SOUTHERN ARGUMENT IN FAVOR OF SUBSIDY.

In a recent address in Charlotte, N. C., Ellison A. Smyth of Pelzer, S. C., discussed the necessity of a shipping bill to stimulate the carrying of cotton to China from southern ports. He said:

"We should heartily favor any measure that would tend to the upbuilding and strengthening of our merchant marine, and I would like to see the day when the United States flag will be as often seen on the high seas as it was fifty years ago. The Hanna subsidy bill, so-called, is endorsed by the National Association of Manufacturers, and its enactment into law would be one step towards the re-establishing of our merchant marine. The Pelzer company is a large shipper of export cottons, and today we are shipping five carloads of sheetings and drills to China, and, as usual with our transcontinental shipments, these goods are routed by the buyers by the most direct line to Canada, then by the Canadian Pacific Railroad to Vancouver and by the British Mail steamship line to China. It is perhaps not altogether strange, under all the circumstances, that while there are three railroad lines in the United States across the continent, and with steamship lines from San Francisco, the Canadian Pacific Railroad and British mail steamship lines bag all the business. It is a fact, however, that from mills in South Carolina goods for China go first to Canada, and thence across the continent. If our steamship lines were also subsidized between San Francisco and China this would not be the case. If it were not for the advantages offered by the Canadian Pacific Railroad—advantages that are being offered by reason of the subsidizing of this line by the British government—the southern cotton manufacturers could not compete in freight rates with the English manufacturers, who can ship from Manchester, England, to Shanghai by the Suez canal at the rate of 50 cents per 100 lbs. In our effort to develop trade with South America we are confronted with the double freights we have to pay in shipping goods, first to Liverpool and then back across the Atlantic to South American ports. There are no steamship lines of any moment, or that have regular sailings, in existence between our ports and those of South America, whereas in Rio de Janeiro alone there are twenty-eight lines of steamships running regularly from Great Britain and the continent. All of these lines are subsidized by foreign governments, and, of course, trade follows the flag. It has been suggested by one of our local papers that this could be overcome by the southern manufacturers chartering a steamer and sending a shipload of goods to South America. This idea lacks practicability, simply because goods are not consigned to export dealers, but are shipped on orders, and from samples previously furnished and in smaller quantities. It would be a costly experiment to consign a shipload of manufactured goods to any foreign port. The day of bartering with the natives is past."



Steamer Mataafa, a modern ore carrier of the great lakes.

A test of the first specimen of Krupp armor for the new battleships, submitted by the Carnegie Steel Co., was made last week at the Indian Head proving grounds, Maryland. The plate represented a group of 412 tons of armor for the Missouri. It was 6 in. thick, and a 6-inch gun was fired. Three shots were fired at velocities, respectively, of 1,865, 1,890 and 1,900 ft. a second. These secured penetrations respectively of 2¼, 2½ and 2¾ in. No cracks were developed and the flaking and condition of the plate were normal. The test was regarded as highly successful and the group of armor will be accepted.

IMPROVEMENTS IN AND AROUND CLEVELAND.

Maj. Dan C. Kingman, the government engineer in charge of the Cleveland district, has filed his annual report with the secretary of war. Of greatest interest to Cleveland is his recommendation that the breakwater be extended eastward to care for the growing commerce of the port. Upon this subject he says:

"The freight tonnage of Cleveland harbor is very large. It amounted to more than 7,500,000 tons in 1900, an increase over the previous year of 178,000 tons. Large as is this commerce this increase is considerably less than in many of the other harbors of the district and this would seem to indicate that the present business is now very nearly equal to the maximum capacity of the harbor. The harbor room within the river mouth is very much cramped and the approaches to it by land are difficult and through the heart of the city. An extension of the breakwater outward, whereby sufficient docks might be constructed along the lake shore, seems to be the only relief from this condition."

Maj. Kingman very diplomatically refrains from specifying how far eastward the breakwater should be extended. Congressman Burton wants it extended to Gordon park and Senator Hanna to Case avenue. He evidently thinks that these gentlemen should decide the point at which the extension should end. He also thinks that the work of dredging the harbor should be taken out of the hands of contractors and performed by the general government itself. Therefore he recommends the construction of a hydraulic dredge. Upon this point he says:

"The real thing of value to navigation in this district consists of certain areas and channels artificially deepened by dredging, all the other works being now designed for their protection and preservation. No work that can be devised, however, will prevent the beach sand from being lifted and scattered by the waves in time of storms, and no works will prevent the rivers from bringing down their annual burden of silt. The utmost that can be hoped for in the way of permanence is to secure the construction of jetties and breakwaters of imperishable materials, and of sufficient strength to resist indefinitely the forces to which they are exposed. After this, it will be only necessary to maintain the depths which we desire by redredging. This will no doubt be a continuous expense, but it need not be a heavy one if the district is properly equipped with machinery to execute the work To be compelled to resort to contracts to secure this dredging is, in my opinion, slow, cumbersome and expensive. I think the district should be provided with a hydraulic dredge of modern construction and design, capable of discharging the excavated material at a distance through a long pipe, or of receiving it in its own hoppers and transferring it with its own power to the dumping ground. Such a dredge should be of the sea-going type. I am of the opinion it could be built for $250,000, and the cost of its repair and maintenance would be $60,000 per annum. I believe such a maintenance can do all the dredging of the kind which will be required hereafter at a cost of less than half the price now paid for contract work."

The balance available on July 1 for carrying on the continuing contract work at Cleveland was $246,805.24, and the amount which Major Kingman suggests should be appropriated for expenditure for this purpose during the fiscal year ending June 30, 1903, is $100,000; for further dredging he recommends $175,000. The total appropriations for Cleveland harbor improvements up to date amount to $2,747,631.61.

Concerning the government aids to commerce and navigation at other ports in the district, Major Kingman says: "At Fairport great trouble is experienced in maintaining the required depth in the harbor. The shore line to the westward of the jetties is advancing rapidly and is now about 1,700 ft. out from where it was when the improvement was commenced. It may be necessary before long to consider the expediency of constructing one or more groins to the westward of the harbor in order to arrest the movement of sand. The cost of maintenance of harbor at Fairport must very soon include extensive repairs and the rebuilding of a large portion of the old jetties. On the east side 595 ft. and on the west side 625 ft. should be rebuilt as soon as practicable. The cost of this, estimated at $120 a foot, would be $146,400. The cost of sheathing and repairing 1,137 ft. more would be $28,425, and the expense of maintaining the channels, $10,000, making a total of $184,825, which could be expended advantageously within a year. In addition to this $200,000 could be expended in the same period on the new breakwater project, to complete which will cost $480,000.

"The shore to the westward of Ashtabula harbor is composed of sand, and the shore line is constantly advancing by accretions washed in by the waves, which obstruct the channel. I think it desirable that the United States should acquire title by condemnation or purchase to at least a half mile of the lake shore to the westward of the jetties in order that this movement of sand might be arrested or controlled by a plantation of willows or by suitable sand fences. The jetties are in a ruinous condition and in great need of immediate repair. The cost of repairing and rebuilding them would be $205,000. This amount is urgently requested. The sum of $300,000 could be expended advantageously next year on the existing breakwater project."

Other estimates for expenditure during the year ending June 30, 1903, are: At Conneaut, $210,000; at Monroe harbor, Mich., $10,000; at Toledo, $280,000; at Port Clinton, $7,000; at Sandusky, $160,000; at Lorain, 310,000; at Huron, $50,000. To complete the breakwater at Conneaut will cost $407,000, and at Lorain $530,350. If the harbor at Vermillion is not to be abandoned the engineer says that provision should be made to restore it to its former condition before it is too late.

The Russian admiral Makaroff is putting his large ice breaker Jermak to the severe test of an extended Polar expedition. The steamer left Tromso a few days ago under the admiral's personal command to test the temperature and degree of saltness of the water northward of North Cape as far as Spitzbergen. This task completed the Jermak will steam in a southeasterly direction and then again to the northeast. She will circumnavigate Nova Zembla and then proceed through the Kara sea to Port Dickson and then up to the mouth of the river Yenisei in the hope of finding a better way for vessels than the one hitherto followed. Subsequently the intention of Admiral Makaroff is said to be to take his vessel in a northerly direction through unexplored waters to Franz Josef Land and then back through the sea between Franz Josef Land and Spitzbergen in order to solve the problem of the supposed existence of Gillesland.

FACTS ABOUT OUR FOREIGN TRADE IN STEEL.

There is no harm in keeping the American public fully informed as to the wonderful growth, technically and commercially, of the iron and steel industry of the United States, provided there be no distortion of truth and no suppression of the facts relating to the trade of other countries. Unfortunately we are only now realizing that harm may be done our domestic industries because a too sanguine view has been taken of our prospects. Among the evils resulting from the one-sided view which has been taken of the case are the Babcock bill and other movements towards a reduction in the tariff. As a matter of fact England and the Continent still have the bulk of the world's iron and steel trade, while we have done only a little more than supply our own demand, although that is of course enormous.

The iron and steel trade of the world is not an auction sale. It is not, as writers and speakers have arbitrarily assumed, simply a question of the cheapest production, and even if it were it has never been proved that the finished iron and steel products of the United States can be placed on board ship cheaper than those of the countries which are competing with us. The comparisons of costs which have been made usually refer only to pig iron or unwrought steel. Where on finished lines American bidders have been below the foreign the large element of profit, which should be allowed for in making comparisons, has been entirely neglected. When British engineering firms are hard pressed to secure orders the results may be entirely different, and before we really capture the world's markets it is reasonably certain that they will be put in that position, at least in times of comparative depression. The productive capacity of American mills and shops is a vastly more flexible quantity than that of British and continental establishments, and it is natural that in times of such great prosperity as the present the overflow should be taken care of in this country. It will not do to point to recent years of depression in the United States and what the country accomplished in the way of exports in those years, because trade in foreign countries was not depressed then in anything like the same proportion, and the recovery came much sooner.

If we but take a few statistics of the actual results accomplished, it will readily appear that whatever may be the possibilities of the United States about which so much has been said, the business and profits are still going to England and other foreign countries. In the eleven months ending with May the exports of England and the United States in a few leading lines are shown in the following table, those lines being taken where the classifications adopted in the two countries most closely coincided:

EXPORTS IN ELEVEN MONTHS ENDING MAY, 1901, LONG TONS.

	Great Britain.	United States.
Pig Iron	971,613	252,637
Steel unwrought	207,936	120,930
Tin plates	229,256	600
Galvanized sheets	209,720	*
Wire	37,061†	66,071

*Not separately stated.
†Excluding telegraph wires.

The above table, which shows the actual results accomplished, certainly affords little ground for the self-congratulation we have heard in the past few years in the United States. In one line alone have we excelled Great Britain. In pig iron and steel and in most finished lines, we are far behind. Where Great Britain exported 209,720 tons of galvanized sheets, our exports were too small to be worth returning separately in the statistics. There might be cause for satisfaction if we had established ourselves in such a position that a rapid growth in the actual results were an absolute certainty, but this is far from being the case. Our plants and methods are very good and represent a remarkable advancement. But if British equipment and methods are far behind those of the United States, how is it that England is still doing the business? Or, granting that England has the trade because of superior machinery of commerce rather than machinery of production, may it not take less time for her to emulate our productive abilities than for us to acquire the machinery of commerce? When we have built up an American merchant marine we may secure the trade, but when we have not been able even to get a shipping bill through congress it is too soon to count our chickens. —Iron Trade Review.

WITH THE SEABOARD SHIP BUILDERS.

The American Car & Foundry Co. lately purchased the steel ship building plant owned by the Jackson & Sharp Co., Wilmington, Del. The purchase included machinery, fixtures and good will of the Jackson & Sharp Co., and it is understood to be the purpose of the new owners to increase the facilities of the plant. Mr. Charles S. Robb will be retained as manager and Capt. Edward Kershaw as superintendent.

Neafie & Levy of Philadelphia have contracted with the Weems Steamboat Co., Baltimore, Md., for the construction of a steel steamer for freight and passenger traffic. The new vessel will be 190 ft. long, 40 ft. wide and 13 ft. deep. She will be equipped with a compound engine and a Scotch boiler 14 ft. 9 in. diameter and 12 ft. length, allowed 125 lbs. steam pressure.

The Marine Railway & Dry Dock Co., San Diego, Cal., has been purchased by the Spreckels Bros. Commercial Co. The ways are now being rebuilt.

Hall Bros., Port Blakely, Wash., launched their hundredth vessel recently. She is a wooden schooner for Pope & Talbot.

Lewis Nixon, Elizabethport, N. J., has just received an order for two gunboats from the Mexican government.

Cobb, Butler & Co., Rockland, Me., will launch the four-masted schooner Joseph Haskell on Aug. 1.

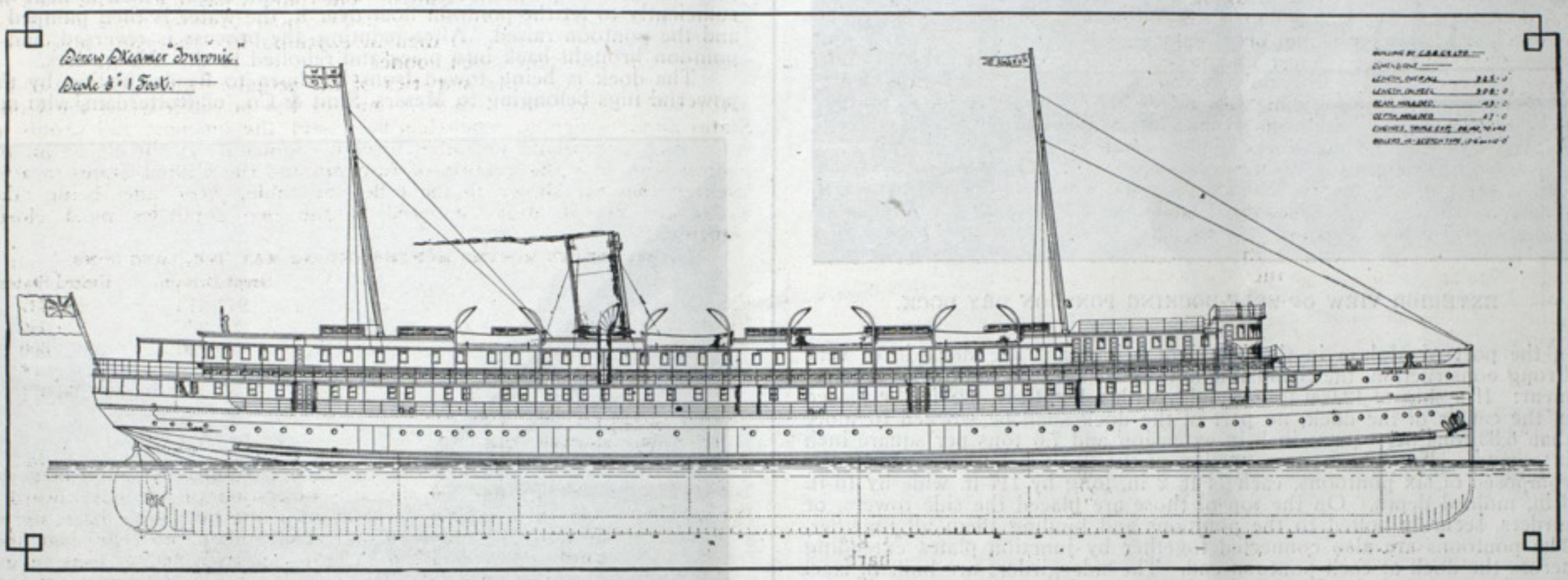
Hans Reed of Bay City, Ore., has laid the keel of a wooden steamer. She will be 237 ft. in length.

COLLINGWOOD SHIP BUILDING CO., LTD.

The screw steel steamer Huronic, building at Collingwood, Ont., by the Collingwood Ship Building Co., Ltd., will be launched about Aug. 20 and will be the finest and largest ship ever built in Canada. This vessel is to run from Windsor or Sarnia to Duluth via Mackinac, Sault Ste. Marie, Port Arthur and Fort William. It is expected that she will make 15½ miles an hour loaded and 17½ miles when running light. She was designed by Hugh Calderwood, manager of the Collingwood company, the plans being approved by Mr. Frank E. Kirby, well-known naval architect of Detroit, who is consulting engineer for the owners. The vessel is built under the inspection of Capt. F. D. Herriman for the classification societies and will have the highest rating, A 1 with a star for twenty years, in the Great Lakes Register and the Bureau Veritas. She is built of open hearth steel throughout and is of the following dimensions: 325 ft. over all; 308 ft. between perpendiculars; 43 ft. beam, and 27 ft. molded depth. The steamer has moderately fine ends and large water ballast capacity. Engines are of the triple expansion type, 26, 42 and 70 by 42 in. stroke, steam being supplied from four Scotch boilers, 12 ft. 6 in. in diameter by 12 ft. long, at a pressure of 175 lbs. per square inch.

The new vessel will have cabin accommodations of the best design for 200 saloon passengers, together with large provision for the carrying of steerage passengers, as there is a double tier of cabins. The main dining saloon will be the full width of the lower cabins, thus making it spacious and well lighted. It will be finished in hardwood. Furniture and general equipment will be the best that can be procured. It is intended to follow the building of this ship with others of the same class.

Work has also been begun on a steel tow barge for the Algoma Central Ry. Co.'s steamship line. This vessel will be 390 ft. long, 46 ft. beam and 26 ft. deep, with a carrying capacity of 7,000 tons. She will rank among the largest steel tow barges of the lakes and will have all modern appliances for the quick and economical handling of both ship and cargo. Provision will be made for the carrying of steel rails on her upper deck. She will come out in April.



SCREW STEEL STEAMER HURONIC, BUILDING AT COLLINGWOOD, ONT.

This company, having a lot of other work in contemplation, will add to its plant by enlarging the dry dock to 530 ft. length and 75 ft. width, and to a depth of 16 ft. of water over the new sill. To do this work they will add to the outer or gate end of the dry dock by cofferdam on the flat rock bottom, and inside of this extension will build stone walls, as is now being done with the present dock. A new set of gates will be placed inside the new basin and the dock when finished will have stone walls and rock bottom the whole length. This work will be done during the winter without disturbing the original dock. The company has just completed a new pumping well, 30 ft. deep in the solid rock, and intend to put in new pumping machinery to take care of the old or new portion of the dry dock. The limestone formation at Collingwood is favorable for such work and the quarries furnish stone cheaper than wood.

There will also be added a machine shop, foundry and boiler shop, so that marine engines and boilers of the largest kind can be built in the yard, thus providing in all respects a modern ship building and engineering plant, with the best of provisions for repairs.

The company recently launched a barge for Hogan & McDonald of Montreal and a tug for the Pigeon River Lumber Co.

The Stow Manufacturing Co., Binghamton, N. Y., has issued a catalogue devoted to the Stow flexible shaft. The introduction to the catalogue is very good. This shaft was placed on the market twenty-five years ago. The catalogue says: "Flexible shafts in connection with the various tools we manufacture constitute a machine shop in themselves; yet we do not for a moment claim that they will ever displace standard tools. Their field is peculiarly their own. If your work is all light, accessible or easily carried to a stationary machine, and you have the machine, you probably do not need the flexible shaft, but whenever on account of weight or position it is desirable to take the tool to the work, instead of the work to the tool, its time and labor saving qualities become specially noticeable."

AROUND THE GREAT LAKES.

Secretary Gage, a few days ago, appointed Joseph P. Cottrell of Detroit inspector of hulls at that port. He has held the position temporarily for three months past.

From Toledo comes announcement of the death of Capt. James Wood, who commanded sailing vessels on the lakes in early days. He retired about ten years ago. Capt. Wood was seventy-two years of age.

The Detroit Ship Building Co. has just closed a contract with Seattle parties for a triple expansion engine of 11, 18 and 31 in. cylinder diameters and 20 in. stroke. The contract also includes condensers and pumps.

The American Ship Building Co. has set apart $50,000 for improving its plant at West Superior. Repairs will be made to the old dry dock and new machinery installed in the different shops. The equipment will be modern in every respect.

Capt. John Ackerman, formerly of the steamer Nyack, became master of the car ferry Pere Marquette last week in place of Capt. Peter Kilty, who, after taking a month's vacation, will take command of the Pere Marquette company's new ferry, now approaching completion at Cleveland.

The Detroit Dry Dock Co., one of the constituent companies of the American Ship Building Co., held its annual meeting Wednesday of last week. The following directors were elected: W. C. McMillan, A. McVittie, Clarence A. Black, all of Detroit, and R. L. Ireland and R. C. Wetmore of Cleveland.

Mr. R. W. Crary of the Dunkley Co., Kalamazoo, Mich., which operates the steamer Petoskey between Chicago and South Haven, has been looking around the lakes for another passenger steamer. The company is considering the matter of building a side-wheel steamer, he says, and if it is decided to go ahead with her construction she will be of about 250 ft. length.

Duluth brokers predict that the fall movement of grain from ports at the head of Lake Superior will break all records. They figure that 60,000,000 bushels of grain will be sent forward before the close of navigation, which is equal to 1,800,000 tons, and that the grain movement from Ft. William will bring it up to 2,000,000 tons. The record for shipments from ports at the head of the lakes up to date is 43,000,000 bushels.

A Washington dispatch announces that the secretary of war has approved an order authorizng an increase in the flowage of the Chicago drainage canal from 200,000 to 300,000 cubic ft. an hour between the hours of 4 o'clock in the afternoon and 12 o'clock midnight. This latter figure was the original flowage but it was reduced upon complaint of the vessel men. It is claimed that there are not many boats moving on the river between the hours named.

At a meeting of the board of managers of the Lumber Carriers' Association, held in Detroit a few days ago, it was agreed to sustain the rate of $2.50 per 1,000 ft. from Lake Superior ports to Lake Erie. So far as is necessary, boats are to be laid up in order to hold up the rate, and an advance to $3 on Sept. 1 was agreed upon. Secretary G. W. Cottrell said that every member at the meeting expressed himself as being in favor of doing everything possible to maintain rates. Among those present were F. W. Gilchrist, Edward Hines, J. A. Calbick, O. W. Blodgett, H. E. Runnells, C. H. Prescott, E. F. Fisher and William Teare.

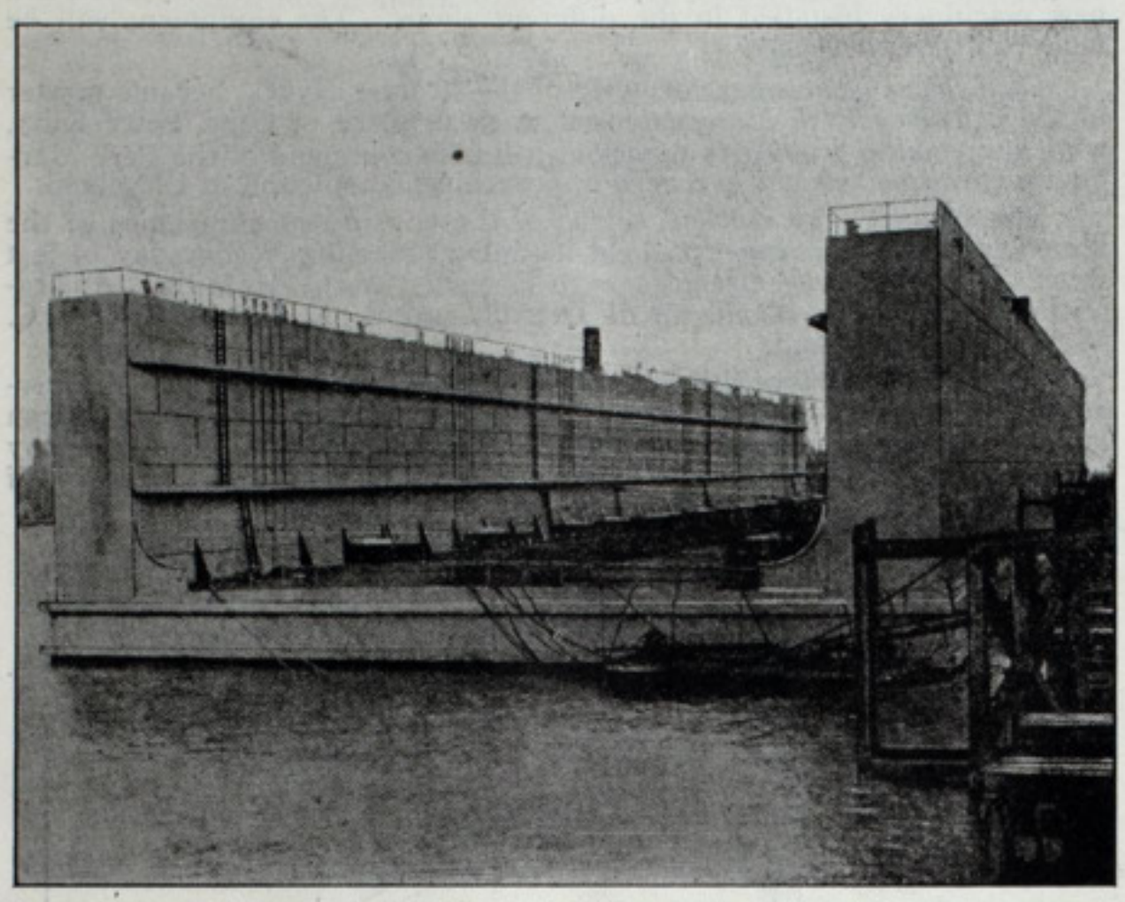
IMPROVEMENTS IN LAKE CHANNELS.

In his annual report submitted to the secretary of war, Col. G. J. Lydecker, in charge of the river and harbor improvements at Detroit, makes no additional recommendation for increasing the capacity of St. Clair flats canal but refers to his previous report. The river and harbor bill, which failed to pass, contained authority for improvements along the line suggested by him. He reports progress upon the work to secure a 20-ft. channel under various contracts. The Lime Kiln crossing channel improvement is well under way. He thinks it should be completed by Dec. 1 when the channel will be 21 ft. deep. An estimate of $136,500 to complete the present project for the improvement of the Detroit river is submitted for insertion in the next sundry civil bill. Maj. W. L. Fitch, in charge of other river and harbor work in the Detroit district, submits the following estimates for work to be done in the next fiscal year: Cheboygan harbor, $615,500; Saginaw river, $50,000; Harbor Beach harbor of refuge, $50,000; Black River improvements, $20,000.

LARGEST DRY DOCK AFLOAT TO DATE.

IT HAS JUST BEEN COMPLETED BY THE SPANISH GOVERNMENT AND IS NOW BEING TOWED TO ITS DESTINATION.

The largest dry dock afloat has just been completed for the Spanish government by Robert Stephenson & Co., Ltd., at their Hebburn ship building yard, England. It is on the self docking pontoon order. The dock was originally intended for the port of Olongapo, the naval arsenal in the Philippine islands, but owing to the change of governmental ownership of the Philippines, it has now been decided to place the dock



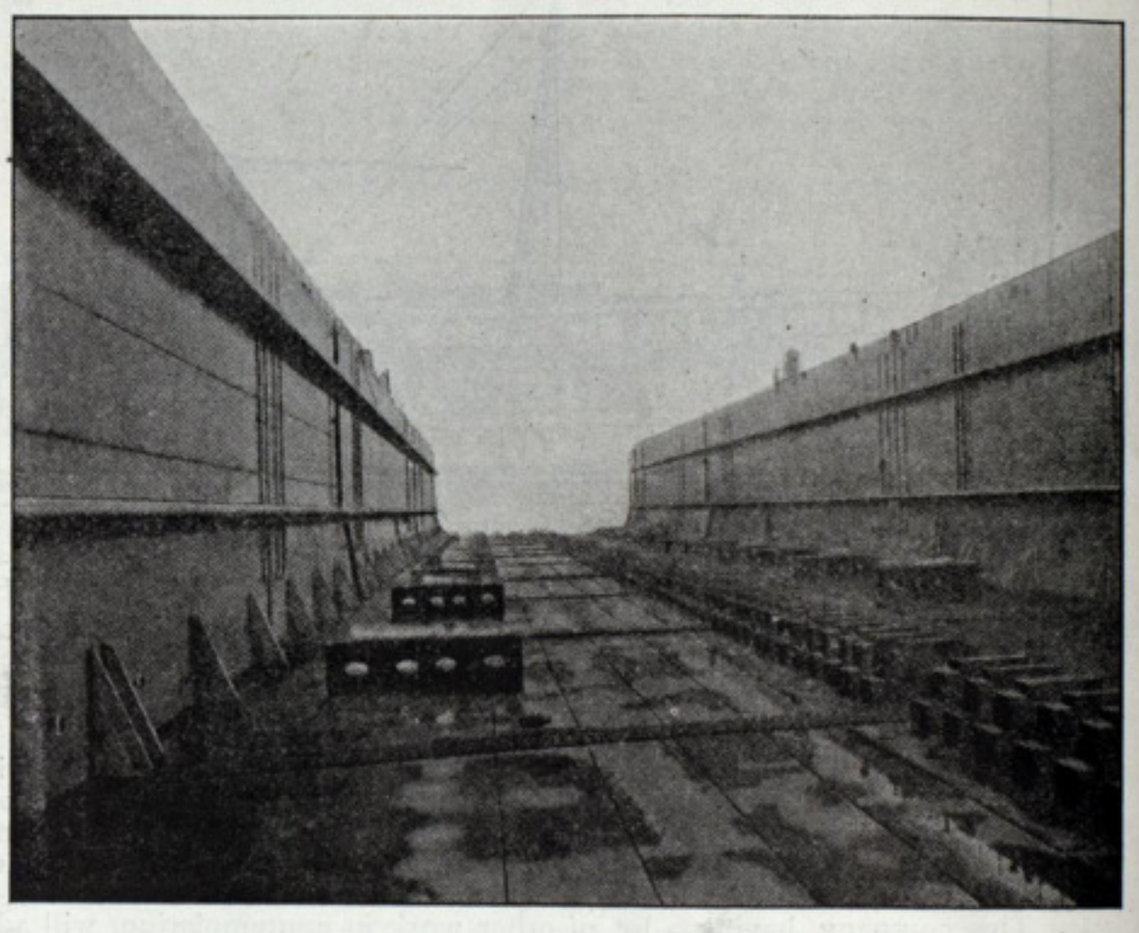
EXTERIOR VIEW OF SELF-DOCKING PONTOON DRY DOCK.

in the port of Mahon in the island of Minorca. The dock is of very strong construction, the Spanish admiralty making the following requirement: If a ship of 12,000 tons weight, with a length of 328 ft., be placed in the center of the dock, no part of the dock shall be worked to more than 6.33 tons per square inch in extension and 7.6 tons per square inch in compression. The bottom portion of the dock is built of iron and is composed of six pontoons, each 74 ft. 2 in. long by 117 ft. wide by 13 ft. 6 in. molded depth. On the top of those are placed the side towers, or girders, securely bolted to the pontoons and binding them all together. The pontoons are also connected together by junction plates extending across the dock at each pontoon end. The side girders are built of steel on account of their having to take the strain when a ship is docked, and also, as being mostly out of water they are not so liable to corrode. The pontoons are very strongly constructed, having eleven fore-and-aft bulkheads, nine of which are water-tight, dividing each pontoon into ten water-tight compartments. This makes sixty water-tight compartments at the bottom of the dock, all of which were tested with a water pressure of 13 lbs. per square inch.

Every fifth frame in the pontoons is a strong partial bulkhead extending across the dock, and over these frames the bilge blocks are placed. The center girder over which the keel blocks are placed is 1 in. thick, and also under the keel blocks 4 ft. from the center on each side, two more fore-and-aft bulkheads are placed. Those with diaphragm plates on every frame make a solid foundation under the keel blocks. The side towers have a safety deck about 14 ft. above the pontoons which prevents the dock sinking altogether, supposing the inlet valves were by any chance left open. Each tower is also divided into ten water-tight compartments. The center compartment of each tower is fitted up with the pumping installation, which consists of two large marine-type boilers working at 120 lbs. pressure and two of Tangyes' 24-in. centrifugal pumps, each worked by a separate engine, also one duplex drainage pump and fire pump, two duplex feed donkey pumps, and a feed heater. This installation is duplicated in the other tower. Together, the four main centrifugal pumps are capable of throwing 23,000 tons of water against a 28-ft. head in two hours. The 26-in. main suction pipes and the main drainage pipes run along inside the side towers, and branch down at each pontoon to a collecting-box from which pipes lead to each compartment of the pontoons. Each of these pipes has a separate valve, worked by a rod and wheel from the top of the side towers. Each compartment has also a wrought-iron air pipe, which is led up the side towers and placed near the standard and wheel which operates the valve to the corresponding compartment. At the top of the air pipe is placed a gun-metal cock. The inlet pipes, which are 19 in. in diameter, are also connected to the collecting or distributing boxes and each inlet pipe has a grid and valve worked from the top of the towers. Every water valve in the dock has an indicating plate and pointer showing how much the valve is open. Each pump, by means of valves, is arranged to draw from one or both ends of the dock, and each pump has a 24-in. valve on the discharge branch, and also a balanced flap valve. The drainage pump is also arranged to draw from each compartment through a separate range of pipes, and there is a gun-metal drainage foot valve at the bottom of each branch pipe to each compartment of each pontoon. The drainage pump is also connected to a range of pipes which are carried along the top of the side towers for washing decks or for fire purposes. The compartments in the side towers are filled and drained through the main suction pipes, and they can also be drained into the pontoons by means of scupper valves worked from the decks of the pontoons.

There are speaking tubes from each tower to the engine room and from side to side. The keel blocks, which are placed 3 ft. centers, are of pitch pine and are 3 ft. 6 in. high. The lower blocks are 18 in. square, and each keel block has a cap piece of oak 6 in. thick. The blocks are fitted between angle iron, and are securely dogged together. There are twenty-four bilge blocks of very strong construction placed on the dock, so that they can be shifted in or out, and on the top of each steel bilge block is a sliding block of oak, which is pulled into position under water by means of ropes led to the top of the towers. There are two shoring shelves inside the dock on each side, 2 ft. 6 in. wide, with a facing piece of elm 9 in by 6 in. The sides and ends of the dock are protected by two American elm fenders securely bolted between angles. On the tower tops are placed fourteen large timberheads for mooring ships using the dock, and four mooring shackles are attached to the pontoon for mooring purposes. Wrought iron ladders lead up from the pontoons to the shoring shelves and tops of towers. On the inner side of the towers in the stokehold, water-tight doors are placed, giving access to the deck of pontoon, and for discharging ashes. The engine room and stokeholds are ventilated by cowl ventilators and a range of ventilating pipes. Feed tanks are placed on each side above boilers, each holding 25 tons of fresh water for feed purposes. There are also bunkers which will hold 30 tons of coal in all. The dock has been so constructed that in the event of damage to a pontoon, or, if a pontoon requires a bottom to be scraped and painted, it can be detached and docked on the dock itself and repaired or painted. This is done by disconnecting the bolts that hold the pontoon to the side girders, and to the pontoons adjoining disconnecting the suction pipes and valve rods, and letting the water through the sea valve into the pontoon when it is disconnected. This causes it to sink below the level of the bottom of side girders, and it can then be easily drawn out at either side. It is then turned round so that the narrow part faces the entrance of the dock, which is next sunk sufficiently to let the pontoon float over it, the water is then pumped out and the pontoon raised. After painting, the process is reversed, and the pontoon brought back into place and rebolted to the side girders.

The dock is being towed from Hebburn to its destination by three powerful tugs belonging to Messrs. Smit & Co., of Rotterdam, who make



INTERIOR VIEW OF SELF-DOCKING PONTOON DRY DOCK.

a specialty of long-distance towing of this description. The voyage is calculated to occupy thirty days. There are two tugs towing, namely, the Zwarte Zee, whose tow rope is of 20-in. manilla, and the Oceaan, having an 18-in. manilla tow rope. The steering is done by the Zuider Zee, whose check rope is of 13-in. manilla. The principal dimensions of the dock are as follows:

	Ft.	In.
Length between perpendiculars	450	0
Breadth, moulded, over pontoons	117	0
Depth, moulded, of pontoons	13	6
Camber of pontoon deck between side girders		9
Breadth, moulded, of side girders	12	2
Depth, moulded, of side girders above pontoons	38	6
Distance over side girders, moulded	115	4
Distance between side girders, moulded	91	0
Distance between shoring platforms	85	0
Distance between pontoons, moulded	1	0
Will lift a ship weighing	13,000 tons.	

Arnold S. Gruber of Nyack, N. Y., has organized the Rapid Boat Co. and will try to secure capital for the construction of fast passenger boats to compete on the Hudson river with railways operating between New York, Tarrytown and other towns up the river. This is the company that proposes to apply to passenger service on the Hudson the designs of C. D. Mosher of New York, who has built two or three "racers" that are said to have attained more than 30 knots speed. It is proposed to make the passenger boats that are now talked of about 130 ft. long and to fit them with quadruple expansion engines of 4,000 H.P. The scheme has not, of course, as yet developed much beyond the newspaper stage.

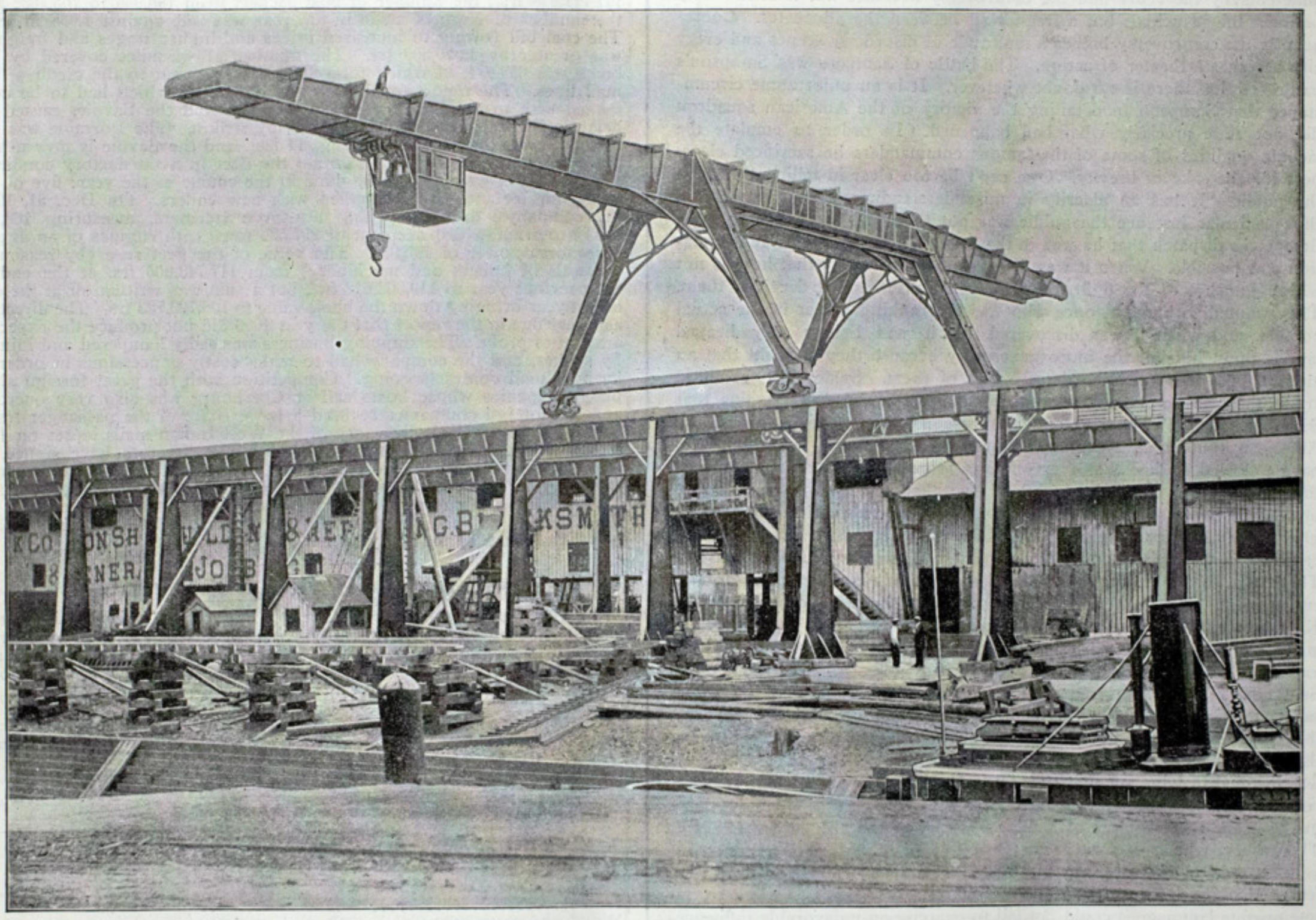
Both the Carnegie and Bethlehem Steel companies have made known to the navy department their willingness to enlarge their plants so that the government will receive 500 tons of armor a month from each concern, or an aggregate of 1,000 tons a month instead of 600 tons.

EXPORTS TO SOUTHERN COUNTRIES.

Exports from the United States to all American countries and islands south of her boundaries show a marked increase in the fiscal year just ended and exceed those of any other year in the history of our commerce. This statement, just announced by the treasury bureau of statistics, is especially interesting in view of the various efforts being made for closer business, commercial, and transportation relations between the United State and her neighbors at the south. New lines of steamers have recently been put on between the Pacific coast of the United States and the western coast of Mexico, Central and South America; a recently published statement indicates that great financial interests of the United States have obtained control of the nearly-completed transcontinental line connecting Argentina with Chile; the establishment of additional direct steamship lines between the eastern coast of the United States and South American ports is under discussion, and the opening of an isthmian canal would give a straight line of water communication from the eastern coast of the United States to the western coast of South America. All of these movements in the direction of closer relations between the United States and her neighbors at the south add interest to the announcement that our exports to those countries in 1901 are larger than those of any preceding year, and to some figures just presented by the bureau of statistics showing the imports of each of the South American countries at the latest date and the exports from the United States to each of those countries in 1901.

The growth of exports from the United States to Central and South America has not kept pace in the past with the growth in other directions. The total exports to South America in 1900, for instance, were no more than those of 1890, being in each of those years, in round numbers, $38,000,000, while the same statement holds good with reference to Central America, the total exports from the United States to the Central American states being in 1890 and 1900 in each case in round numbers $5,000,000. It is to Mexico and the West Indies that our exports in the decade 1890-1900 show the greatest increase, being to the West Indies, in 1890, $33,000,000, and in 1900, $47,000,000; and to Mexico, in 1890, $33,000,000, and in 1900, $34,000,000. The fiscal years 1900 and 1901 show a much greater increase in our sales to our neighbors at the south than in any preceding years. The total exports to Mexico, Central and South America and the West Indies in 1899 were $103,000,000, in 1900, $127,000,000, and in 1901, $138,000,000 in round numbers. Thus the figures of 1901 are $35,000,000 greater than those of 1899, while the 1899 figures are only $1,000,000 greater than those of 1893.

The importance of satisfactory transportation facilities is illustrated by a study of the growth of our export trade with the countries at the south. Prior to the construction of railway lines connecting Mexico with the United States, our exports to Mexico seldom reached $10,000,000; by 1896 they were $20,000,000; by 1899, $25,000,000; in 1900, $34,000,000, and in 1901, $37,000,000, in round numbers. To the West Indies, the transportation system is much more satisfactory than to the South American countries, and to those islands our exports have grown from $34,000,000 in 1891 to $49,000,000 in 1901. To Central and South America, with which steamship communication has not been satisfactory, the growth has been less, the figures, as already indicated, being in 1900 practically the same as in 1890, while the figures for 1900 and 1901 show in each case a considerable increase. This increase is especially notable in the exports to the countries on the western coast of South America reached by the recently established lines connecting the western coast of the United States with that of South and Central America, and which were put into operation about the beginning of the present calendar year. The figures of our exports to South America show an increase of nearly 100 per cent. to Peru in eleven months ending with May, 1901, as compared with the same period of the fiscal year 1900, and nearly 100 per cent. to Chile in the same time. Of the increase of $6,000,000 in exports to South America in 1901 as compared with 1900, more than two-thirds is to the countries on the western coast.



Gantry crane (15 tons) at works of Buffalo Dry Dock Co., Buffalo, N. Y.

Designed and built by Wellman-Seaver Engineering Co., Cleveland.

FOREIGN NOTES OF INTEREST.

During June Scotch ship builders launched twenty-nine vessels of about 47,028 tons gross, as compared with thirty-five vessels of 56,132 tons gross in May and thirty-two vessels of 52,528 tons gross in June last year. In the six months Scotch ship builders have launched 135 vessels of 246,752 tons gross, against 232,584 tons gross in the corresponding period of last year, 256,310 tons in 1899 and about 227,608 tons gross in 1898.

English ship builders in June put into the water twenty-two vessels of about 76,818 tons gross, against thirty vessels of 95,544 tons gross in May; twenty-one of 73,077 tons gross in June last year; twenty-two of 72,974 tons gross in June, 1899; and twenty-six of 93,383 tons gross in June, 1898. For the six months English builders have launched 126 vessels of about 422,699 tons gross, as compared with 127 vessels of about 339,803 tons gross in the corresponding period of 1900.

A record in rapid coaling was made the other day by the Prince George of the British channel squadron. She was the only ship that filled her bunkers at the coaling point and was assisted by three cranes from the shore side. The ship took in 1,206 tons in 5 hours and 20 minutes of working time, giving an average of 226 tons an hour. Last year when five ships coaled in the same way the Mars established the channel squadron record with an average of 203.7 tons.

A shallow water barge, the Newport, was launched last week from the yards of the Kelley, Spear & Co., Bath, Me., for the Staples Coal Co., Taunton, Mass. She is designed especially for navigating shoal rivers and harbors and is 150 ft. long, 31 ft. beam and 8 ft. deep. She is a duplicate of the Rockland, launched a few weeks ago.

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The embers of the Sampson-Schley fire need only to be stirred to burst into flame; and a long caravan of naval officers, laymen and newspapers stand ready to heap fuel upon it. When things are somewhat dull these two celebrated characters are called upon to divert the public. It is the one theme which can be played upon indefinitely. Each counts his adherents by the score and the controversy becomes not a controversy between the principals but a free-for-all between the advocates. Consequently the controversy breeds a multitude of disorderly scenes and every city becomes a theater of action. The battle of Santiago was Sampson's battle—of that there is no doubt whatever. It is an unfortunate circumstance that Sampson in detailing the victory of the American squadron did not state precisely what had happened. In order to emulate the laconic qualities of some of the famous commanders he sacrificed clearness for the sake of brevity. One can't be too clear in telling things to the public. It has an alacrity in misunderstanding. But assuredly in this particular instance the public was not to blame for believing from Sampson's dispatch that he was in the fight. In fact no other interpretation was possible. When it was discovered the next day that he was not within gunshot of the fight, the people felt that he had deceived them. They wanted to know at once who was the ranking officer in the actual conflict, and when it was discovered that it was Schley they heaped laurels upon him all the more generously because they thought that an attempt had been made to deprive him of them. Schley got far more credit than he deserved and Sampson far less. The fact remains that Sampson was in command and was responsible for the action of the American squadron. Since then, however, charges and countercharges have followed so fast that everyone has forgotten the original cause of the controversy; but it is doubtless true that if Sampson had been a profound student of human nature he could have averted it altogether by giving no cause for its existence. There never has been any particular criticism of Schley's conduct during the engagement in official sources. There was, however, considerable criticism of his conduct prior to the engagement. His deliberate violation of orders in endeavoring to go to Key West to coal when he was told to stay at Santiago gave the officials at Washington a nervous fright: and it has never been satisfactorily explained why he spent four or five days in going from Cienfuegos to Santiago. That is not saying, however, that there may not be some satisfactory explanation of his action. Rear Admiral Bob Evans says that the Brooklyn was never informed of the message of friendly Cubans that the Spanish fleet was not at Cienfuegos and that, therefore, Schley was justified in lying off that port from May 21 to May 24. The present revival of this celebrated case is due to the use of some villainous language in the third volume of Maclay's history of the United States navy. The author, who is a clerk in the Brooklyn navy yard, has written two volumes which are used as text books at the naval academy. It was feared that the third would also be used as a text book. Owing to its intemperate language it could not fail to exercise an unfavorable influence against Schley in the minds of the cadets. The expressions are doubtless Maclay's personal views and reflect as little credit upon him as a historian as they do upon Schley as a commander. They have no place in a history which should be an impartial and unbiased review. The strange part of the whole affair is that the proofs seem to have been read in the navy department and that the book is issued, if not with the consent, at least with the knowledge, of that department. Schley has asked the secretary of the navy for a court of inquiry and will probably also sue the historian. It is surprising that he did not insist upon the former course long ago.

One of the perplexing problems confronting the navy department at present is that of obtaining sufficient commissioned officers to command the new ships building and which are from week to week leaving the builders' hands. The shortage is particularly noticeable for the small craft building, such as torpedo boats and torpedo boat destroyers. Thirty-five torpedo boats and torpedo boat destroyers are soon to go into commission with no one to command them. To put young naval cadets without experience in charge of these vessels would be altogether too risky a performance. Before the end of the summer the navy will have a numerous torpedo flotilla, and the board of officers appointed to decide upon a scheme of coast protection with boats of this class has practically determined upon establishing a series of torpedo stations extending from Portland, Me., to Pensacola, Fla. Three main stations will first be established at New London, Conn., Port Royal, S. C., and Pensacola, Fla. It will be impossible to carry these plans into action, however, until the quota of commissioned officers is complete.

BUSINESS OF THE FRENCH LINE.

According to the reports of the directors of the French Transatlantique Co., the total receipts in 1900, including subsidies and the sum brought forward from the previous year, amounted to 55,290,640 frs., and the expenditure, interest on loans, etc., amounted to 48,649,448 frs., thus leaving a gross surplus of 6,641,192 frs. When compared with 1899, the income shows an increase of 5,764,514 frs., and the outgoings an increase of 5,578,128 frs., and the relation of expenditure to income rose from 86.96 per cent. to 87.98 per cent. The increase in the traffic is to a great extent attributable to the Paris exhibition, and was most in evidence in the New York line, although the intention of the directors to put the two new boats Lorraine and Savoie into the passenger service was not fulfilled. The emigrant traffic, also, was greater than in the previous year. In the West Indian line the earnings were satisfactory, and further progress was made in the lines to Tunis and Algeria; the takings in the coasting services, too, maintained their ordinary level. In spite of the active employment found for the fleet, two of the company's steamers (La Champagne and Bordeaux) were chartered to the French government. The number of passengers carried rose from 240,091 in 1899 to 266,145. On the other hand there were fallings off in the following directions: the quantity of cargo carried fell from 667,078 tons to 660,824 tons; the value of the bullion and securities conveyed, from 170,177,452 frs. to 141,711,248 frs.; the number of post-packets from 768,036 to 765,763; and the number of voyages made in the year was 963, against 1,068 in 1899. The coal bill (owing to increased prices and higher wages and freights) was greater by 1,970,309 frs. The number of sea-miles covered by the boats was 699,014, of which total 458,596 miles went to the credit of the mail lines. The report touches on the difficulties which had to be contended with in the building of the Lorraine and the Savoie, caused by delay in the delivery of materials and by strikes. The Lorraine was put in the New York service on Aug. 11 last, and the Savoie is now nearly ready for sea. In order to maintain the fleet in a satisfactory condition a great deal of work had to be done in the course of the year: five of the boats, for instance, were supplied with new boilers. On Dec. 31, 1900, the company's fleet comprised fifty-seven steamers, measuring 168,336 tons gross and a displacement of 257,522 tons, with engines of an aggregate horse power of 186,950. The value of the fleet rose (by reason of renewals of boilers and machinery) from 117,743,965 frs. at the end of the previous year to 119,362,612 frs., but a sum was written off at the end of last year bringing down the book-value to 106,793,723 frs. The directors acknowledge in the report that the year 1900 did not produce the expected amount of profit. The shipping business was sadly hampered and injured by strikes, and the company had to make costly concessions in order to keep its mail contracts going. Competition with the great foreign shipping companies whose boats call at Cherbourg was also very onerous, and the foreign companies secured a large share of the passenger trade. The contract for the conveyance of the West Indian mails lapses on July 21, 1901, and has not been renewed, but the directors have signed an undertaking to continue the service for the present under certain conditions. After placing the sum of 5,085,000 frs. to the redemption fund, 1,556,192 frs. remain out of the gross profits for distribution among the shareholders, and a dividend of 16 frs. per share of 500 frs. will be paid, being the same as for the year 1899.

SHIP BUILDING IN THE UNITED KINGDOM.

From returns compiled by Lloyd's Register of Shipping it appears that, excluding warships, there were 441 vessels of 1,300,179 tons gross under construction in the United Kingdom at the close of the quarter ended June 30, 1901. Particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1900 for the purpose of comparison:

Description.	June 30, 1901. Number.	Gross tonnage.	June 30, 1900. Number.	Gross tonnage.
STEAM.				
Steel	409	1,287,366	436	1,243,307
Iron	2	380	35	6,661
Wood and composite	2	72	2	870
Total	413	1,287,818	473	1,250,838
SAIL.				
Steel	15	10,948	8	12,370
Iron	..	..	..	..
Wood and composite	13	1,413	18	2,105
Total	28	12,361	26	14,475
Total steam and sail..	441	1,300,179	499	1,265,313

The present return shows a decrease in the tonnage under construction of about 3,000 tons as compared with the figures for last quarter. As compared with the return for December, 1898, which is the highest on record, there is a reduction of 101,000 tons. Of the vessels under construction in the United Kingdom at the end of June, 374 of 1,062,464 tons are under the supervision of Lloyd's with a view to classification by that society. During the quarter 148 steam vessels of 342,251 gross tons and fourteen sail vessels of 8,680 gross tons were begun, and 160 steam vessels of 392,864 gross tons and seventeen sail vessels of 5,721 gross tons were launched. During the quarter there were under construction in private and royal shipyards fifty-six warships of 403,225 gross tons.

The torpedo boat Stringham, built by the Harlan & Hollingsworth Co., Wilmington, Del., met with an unfortunate accident just prior to her trial trip last week. The little vessel had just got out into mid channel when a tube in the after boiler blew out and scalded six of the crew badly. The accident cannot be accounted for as there was no high pressure on at the time.

There have been no developments of note in the new ship building project at Chester, Pa., to which the Review lately called attention, but it is understood that all preliminaries have been satisfactorily arranged and that 97 per cent. of the $3,000,000 capital stock has been subscribed. It is understood that the plant will employ about 4,000 men.

GERMANY AS A FRIGHTFUL EXAMPLE.

From the Engineer, London.

For some years worthy men, mostly incompetent to deal with commercial questions, have written and spoken, and reported, and narrated anecdotes, and excited themselves in various ways about Germany, her thoroughness, her technical schools, her cosmopolitan travelers—commercial—her enterprise, her push. We have been told that if we are not up and doing, Germany must, would, and could command the markets of the world, and the British manufacturer should be left lamenting. During the last year little, however, has been heard about Germany as an example of all the commercial virtues highly concentrated, the United States having, for the time being, taken the place of Germany. Like "Brer Rabbit," in Uncle Remus' veracious and amusing narratives, the British manufacturer has "kep on never minden," and for some reasons, doubtless inscrutable to the prophets of evil, disaster has not befallen this country. It is industrious and prudent Germany that suffers. The facts are in many ways interesting.

For reasons not sufficiently explained, for some time past Germany has launched into a very large internal expenditure. Engineering works have been constructed, and ironworks established; pits sunk; ship yards enlarged, and, in a word, we have seen an enormous manifestation of industrial enterprise. Shops have been enlarged and new tools put down, and it must be remembered that these things represent a far more lavish expenditure than would obtain here under similar circumstances, because the German buyer is willing to pay more than the British buyer. For example, the price of high-class steam engines in Germany is at least half as much again as in this country. It will be remembered that various writers have pointed out that the reason why Germany could spend so much was that the banks freely advanced money for industrial purposes. It is well known, indeed, that by far the larger proportion of the manufactories of all kinds in Germany are either directly the property of the banks or heavily mortgaged to them. Nothing at all of this kind exists in this country, and it has been held that this is a blot on the banking practice of Great Britain, and that money is locked up, or directed into other channels, that ought to be employed in fostering industrial enterprise, and so forth. As long ago as the end of last year it was known that Germany was in difficulties. There was no available ready money with which to carry on business. Everything was locked up in tools and machinery, blast furnaces, and manufactures of all kinds. Even under these extremely inconvenient conditions, it was possible to get along while trade was good. But the natural result of this enormous development has been over-production, and very disastrous reports reach us from the continent. The Leipziger bank has failed for a great sum. A run has already taken place on other banks. How great the strain is is shown by the latest return of the Imperial Bank of Germany. Not only is there a decline of nearly five and a half millions in cash in hand, as compared with a decrease of only three and a quarter millions at the same time last year, but other securities show an increase of over fourteen millions, a similar advance being also recorded in the note circulation. Works are being closed and men discharged in every direction. Political troubles have arisen to embarrass the government, and for the time being Germany is playing the part of the frightful example to the rest of the world. The critics of British methods have not in any way understood the inner commercial life of nations; and they have forgotten that the steady method of creating trade which has made Great Britain what she is, is a surer road to national opulence than a spasmodic and brilliant expenditure without much consideration for the results. Much of the difference between the German and the English method may be summed up by the statement that the Englishman spends his own money, and the German someone else's.

To apply the lesson to a particular case. Heavy censure has fallen upon English engineers because they have not constructed works for building locomotives. Why should orders go to the United States for railway engines? Why not keep the trade in this country? Why let the United States build for our colonies? and so on. The answer to all this is that locomotive building represents a form of speculation which may or may not be prudent. The English capitalist is always on the look out for good investments. It will be found that all successful engineering works have been built up by engineers; and that the capital foundation of such works has been supplied—generally by degrees—by the engineers who have started the undertakings originally. Now, engineers have very carefully considered the whole locomotive building question, and they have taken note of the fact that it has all, with one or two exceptions, drifted away from England to Scotland. There are good commercial reasons for this, no doubt. We need not stop to consider these. It is sufficient for our present purpose to note the fact. In Scotland we find that a very considerable development of locomotive works has taken place, yet no engineer has felt justified in starting new works in the north, while in England it is clearly understood that they could not be made to pay. In one word, the lack of power to supply foreign orders for locomotives in a moment is not due to indolence, failure to understand the situation, or ignorance of the facts; but simply and wholly to the well-reasoned argument, leading to conviction, that money invested in locomotive works could not be made to pay adequate dividends. The British manufacturer may be right or he may be wrong in his conclusions; but he is hardly ever wrong in the way or for the reasons that his critics imagine. Furthermore, it is noteworthy that attempts to form companies for the establishment of new works seldom or never succeed unless they find favor in the eyes of men who have experience of the proper kind. The amateur company—and there have been plenty of such companies—invariably comes to grief, and can only be rescued, if at all, by competent individuals. All the complaints urged against British methods work out in the main to a statement that as a manufacturing people we are not sufficiently speculative. We are content with 4 or 5 per cent, where we might have 20, 30, 50 per cent if we pleased. Men who have no money at all to invest, and know nothing of business, urge those who have to plunge as heavily as so many gamblers. It may be that in this country we are over cautious; yet things seem to work out all right in the end.

The banking industry of this country is much like any other. It succeeds when well managed by competent men neither too cautious nor too courageous. Probably there is no country in the world wherein, as a whole, banking is on a sounder basis than it is with us. We refuse to believe that anything would be gained, nothing risked, by our banks investing largely in commercial speculations. The result might be for a time an inflated apparent prosperity, such as would perhaps follow a large augmentation of our paper currency; but the results could not fail to be doubtful, if not disastrous. Our bankers understand how and when to help trade, while they are doing their own clients good service. The experience of Germany goes to show that we in this country have taken the better path. We can heartily commend the course of events just now in Germany to those critics who have so long held her up as the example of all that is good, as well in banking as in engineering.

EUROPEAN AGENTS OF NORTHWESTERN STEAMSHIP CO.

Syren & Shipping of London has this to say of the Northwestern Steamship Co.'s venture and of the agents who handle the company's business in London:

"The advent of the Northwestern Steamship Co.—the pioneer route between Chicago and European ports—has brought the firm of Messrs. G. W. Sheldon & Co. (as general European agents of the line) in a marked degree before the notice of the shipping world. No expense has been spared in the fitting up of these vessels, which has been carried out by the owners with the intention of carrying goods, both with expedition and economy, between Chicago, Montreal and Europe. The above named firm was established in 1872 by Mr. George W. Sheldon, who is its present head, and by dint of perseverance and exceptional business ability he has attained a unique position as the pioneer Chicago expert in American custom house business. Mr. Henry W. Ackhoff is in partnership with Mr. Sheldon and with long experience of the intricacies of shipping he has proved himself a most capable second in command. The firm were import freight agents to the United States government for the Chicago exposition and were again appointed export freight agents by the same government for the Paris exposition. In March, 1899, Messrs. G. W. Sheldon & Co. established offices in London under the entire control of Mr. Lachlan Taylor. Mr. Taylor quickly proved that the venture was indeed a happy one, and after a very few months he found it necessary to move to larger and more commodious premises at No. 38 Leadenhall street, E. C., where the firm has now a suite of the best equipped shipping offices in London. Owing to the rapid strides made by the firm in England it was recently decided to open an office at No. 17 James street, Liverpool, and these excellent quarters have been thoroughly equipped with a competent staff in charge of Mr. W. H. Moffatt. Messrs. G. W. Sheldon & Co. employ a staff of over fifty in their Chicago and New York offices."

VESSELS LAUNCHED IN BATH, ME., CUSTOMS DISTRICT.

SIX MONTHS, ENDED JUNE 30, 1901.

Cuba and Acme are steel; all others wood.

Rig.	Name.	By whom built.	Gross tons.	Length.	Beam.	Depth.
Barge	Havana	Kelley, Spear & Co.	1,617	240	43	19
Schr.	O. C. Curtis	Percy & Small	2,374	265	43	23
Schr.	E. G. Folwell	New England Co.	1,263	197	40	18
Schr.	May Neville	James W. Hawley	1,191	195	40	18
Schr.	Seguin	Frank S. Bowker	405	144	34	11
Stmr.	Hockomock	William T. Donnell	153	76	27	10
Schr.	C. S. Hirsch	Kelley, Spear & Co.	620	173	36	13
Schr.	M. B. Seavey	Gardner G. Deering	1,247	203	40	26
Barge	Whitman	Kelley, Spear & Co.	497	163	34	10
Tug	Cuba	Bath Iron Works	650	166	29	19
Barge	Matanzas	Kelley, Spear & Co.	1,617	240	43	19
Schr.	M. P. Small	Percy & Small	2,178	265	46	22
Barge	Cardenas	Kelley, Spear & Co.	1,576	246	43	19
Barge	Rockland	Kelley, Spear & Co.	481	164	34	10
Ship	Acme	Arthur Sewall & Co.	3,288	322	45	26
Schr.	Springfield	New England Co.	633	172	36	14
Schr.	Ada Brown	C. V. Minot	1,450	222	42	19
Barge	Weir	Kelley, Spear & Co.	311	154	31	9
Schr.	Inez Carver	New England Co.	730	168	36	13
Barge	Sagua	Kelley, Spear & Co.	1,585	246	43	19

Recapitulation—Ten schooners, 12,091 tons; seven barges, 7,684 tons; one ship, 3,288 tons; one tug, 650 tons; one steamer, 153 tons; total, 23,866 tons.

IMPORTANT CHAIN ORDER.

The Newhall Chain, Forge & Iron Co., Havemeyer building, No. 26 Cortlandt street, New York, has just secured an order for the manufacture of the large anchor chain cables required by the Eastern Ship Building Co. of New London, Conn., for the two large steel steamers which the latter company is building for Pacific service. These steamers, known as the Hill liners, will be the largest freight steamers in the world. The order is for 660 fathoms of 3 3/16-in. diameter iron and 300 fathoms of 1 7/8-in. diameter iron, stud-link cables, the former to be constructed in shots of 15 and 30 fathoms each, which are to be connected with 3 7/16-in. shackles and swivels. Each link of this large-sized chain will measure approximately 19½ in. in length and about 11½ in. in width, and will weigh about 100 lbs. to the foot, so that a total of about 215 tons is represented in this one order.

The 3 3/16-in. chain will be the largest ever attempted in this country, if not in the world, and the Newhall company is to be congratulated in representing in this order the well-known iron expert and chain maker, Mr. Eli Atwood, formerly of Staffordshire, England, and now the president, general manager and superintendent of the Lebanon Chain Works, in whose shops this chain will be made. The chain will be inspected and tested under the supervision of inspectors of Lloyd's Register of Shipping. The competition on this order between England and the United States was exceedingly close.

The Newhall company manufactures high-grade hand-made dredge and steam shovel hoisting chains, close link and stud link yacht and ship cables, special steel loading and skidding chains, shackles, swivels and other forgings.

Mr. C. E. MacArthur of Mobile, Ala., has written and published a little book entitled "Navigation Simplified," which is having a ready sale. The little work is not written for scientists, but for seamen and others who wish to learn navigation. The author spent forty years at sea, and his chief aim in writing the book is to place before the nautical public a convenient handbook that will simplify the study of navigation and at the same time keep to the high standard required for the local inspectors' examinations. Yachtsmen with the aid of this little work are enabled to learn navigation in the shortest possible time.

LIMIT OF ECONOMICAL SPEED.

ONE PER CENT. INCREASE OF SPEED BEYOND THE ECONOMICAL LIMIT IN ORDINARY VESSELS MEANS FIVE PER CENT. INCREASE IN HORSE POWER—SOME VALUABLE DEDUCTIONS.

Mr. E. Tennyson D'Eyncourt read a paper at the last meeting of the Institution of Naval Architects upon the subject "The Limits of Economical Speed of Ships." As it is a subject of vital interest at present it is herewith reproduced:

A wish has frequently been expressed at meetings of this institution that members would give results of their experience derived from the actual performance of vessels on progressive trials and the methods they adopt in estimating the power necessary for driving ships at given speeds; more especially was this the case when Mr. James Hamilton read his paper on "Horse Power Deduced from Progressive Trials," three years ago. I have therefore endeavored to bring into line the data obtained from a large number of progressive trials of ships of different forms and to derive certain broad practical rules from these data, which may, I trust, be of interest and may possibly elicit the results of their experience from others who have made a study of the question. I think it has, perhaps, been too common a practice in fixing the speed for a vessel, and in estimating the necessary indicated horse power for that speed, to overlook the question of what speed is appropriate to the form of vessel under consideration and to go upon the broad basis of allowing plenty of margin of horse power, with the result that often too high a speed has been aimed at and too much power has been allowed. As a necessary consequence the weight and cost of the excess has been a continual burden upon the earning capacity of the ship. This was, perhaps, very well when competition was not so keen, but nowadays when cost has to be cut down to a minimum in every direction, not only by the ship builder but also by the ship owner, the question of giving a ship enough, and not too much, power and speed has become one of first importance. It is necessary to bear in mind the fact that every ship has an appropriate limit of speed beyond which it is not economical to attempt to drive her; or, in other words, any increase of speed beyond this limit requires an undue increase of power. It has therefore been my object to arrive at a method of defining this limiting speed for ships of different sizes and different forms. To attempt to arrive at a general solution to meet all cases is, I need hardly say, an impossibility; but I venture to think that a fair approximation to the suitable power and speed may be arrived at by a consideration of the general principles governing the relation between the dimensions and form of ships on the one hand and the appropriate speed and power on the other. To obtain accurate values it is, of course, necessary to consider each case individually upon its own merits; to have the exact form of the under-water body and a record of the performance of a similar ship or of model experiments. In analyzing the trial results which I have had at my disposal I have not attempted to divide the indicated horse power absorbed into all the heads, which, in making an exhaustive analysis would perhaps be necessary; but I have for the sake of ease in comparing the performances of different vessels always assumed the effective horse power to be half the indicated horse power. This is a somewhat crude method, perhaps, but I think as good as any other where so many unknown or at least doubtful quantities are involved. I think, also, this is a fair average value to assume for the propulsive coefficient with modern triple or quadruple expansion machinery and suitable propellers at the higher speeds which I am considering. Having, therefore, made this assumption I have proceeded to calculate the horse power absorbed by skin friction on the basis given by the late Mr. Froude and now universally adopted; and all the difference after deducting the skin horse power from the effective horse power at any speed, gives the power necessary to overcome the so-called residuary resistance, which at the higher speeds is principally caused by wave-making. For brevity's sake this may be termed the wave horse power.

The different values of the wave horse power obtained by this method for similar ships, and in some cases for sister ships, show up the variations in the value of the propulsive coefficient of propeller efficiency, etc., actually occurring in practice; but the merit of the method lies in the fact that it gives a definite comparison between the performances of different ships. The naval architect must make allowance for the efficiency of machinery, etc., as experience dictates. Having obtained curves in the manner indicated for many ships of varying dimensions, forms and degrees of fineness, I have been able to deduce the general results shown in the table below. This gives the coefficient of fineness and the amount of parallel body which may be associated with that coefficient, and the corresponding limiting economical speed, expressed as a percentage of the square root of the length of the ship in feet on the water-line.

Coefficient of fineness.	Parallel body as percentage of total length of ship on W. L.	Limiting economical speed in knots as percentage of $\sqrt{L}$ in feet.
.5	0	100
.6	14	86
.7	30	68
.8	49	48

Diagram I. shows these values in curves P P and L L. The former gives the appropriate length of parallel body, which is equivalent to giving the combined lengths of entrance and run; and it will be seen that the percentage values of $\sqrt{L}$ for the limiting economical speed are practically the same as the percentage values of the combined length of entrance and run. This agrees with the value which has been given previously for vessels with no parallel body, but gives a smaller economical speed for vessels with parallel body, the previous rule having been that the economical speed is equal to the square root of the sum of the lengths of entrance and run, and it seems to show that a penalty must be paid for introducing parallel body.

Taking actual trial results, I find that the indicated horse power at the limiting speed, as defined above, is varying as the fourth power of the speed, and varies, in increasing ratio, till at about 12 per cent. above the limiting speed it is varying as the seventh power of the speed; whilst the wave horse power varies as v^7 at the limiting speed, and as v^{10}, or sometimes as a higher power of v, at 12 per cent. above the limiting speed; and that at this point, viz., about 12 per cent. above the limiting speed, the wave horse power is approximately equal to the skin horse power, and then rises above it, the skin horse power, of course, always varying as $v^{2.83}$.

Diagram II gives a typical curve of horse power, A A being the curve of effective horse power, with 100 as its value at the limiting or unit speed. Curve B B gives the skin horse power, and curve C C the wave horse power. I have not taken the curves below .6 of the limiting speed, as it is not necessary to do so for my present purpose.

The ratio of wave horse power to skin horse power at the limiting speed depends, of course, upon the form of entrance and run and the mean girth of the vessel up to the water line; but ½ seems to be a fair average value for vessels of fine entrance and run and full midship section. If the midship section is fined, and the wetted surface thereby reduced for the same block coefficient, it naturally follows that the entrance, or run, or both, must be filled out, with the effect that the skin resistance is reduced, and the wave-making increased, bringing the curves of skin horse power and wave horse power more closely together, as indicated by the dotted curves on the diagram, and bringing the point where skin horse power is equal to wave horse power to a lower speed.

It is therefore impossible to lay down general rules to meet all cases, as the variations which may occur are almost infinite in number, and so only an indication of the kind of thing that may be expected can be given. Considerations of stability, involving beam, or fulness of water line, or of girth, which affects weight of hull, more especially if the vessel is to be built to Lloyd's rules, or the question of docking facilities, are merely examples of what the designer has to take account of, and they often hamper him in adopting what he knows would be a better form, or more suitable dimensions for the speed than those he is compelled to take.

The results I have obtained are from the trials of vessels of good form for the coefficients of fineness they possess. But there are many ships whose performances are not so good as I have indicated, and there are others, again, with better performances; the latter, however, generally speaking, appear to have had rather better propulsive coefficients than the 50 per cent. I have assumed; one or two examples apparently having values of 57 to 58 per cent. The values of the admiralty constant,

$$C=\frac{D^{\frac{2}{3}}v^3}{I.H.P.}$$

at the limiting speed, as found above, are fairly uniform, varying, however, with the size of ship as given by the table below:

Length of ship on water line. Ft.	Value of C at Limiting speed.	Value of C when skin H.P.=wave H.P.
200	225	188
300	256	207
400	278	224
500	295	237
600	310	246

These values of C are less for the smaller ships, on account of the higher coefficient of friction for the shorter length of vessel, and also on account of the error in the assumption of the general truth of the law of comparison when applied to the whole resistance. These two causes are not, however, sufficient of themselves to account for the decrease in the value of C. I think this decrease is partly due to eddy-making,

Fig. 1. Curve L L gives values for Limiting Speed as a percentage of √L for different block coefficients. Curve P P gives corresponding lengths of parallel body as percentage of length on W L for different block coefficients.

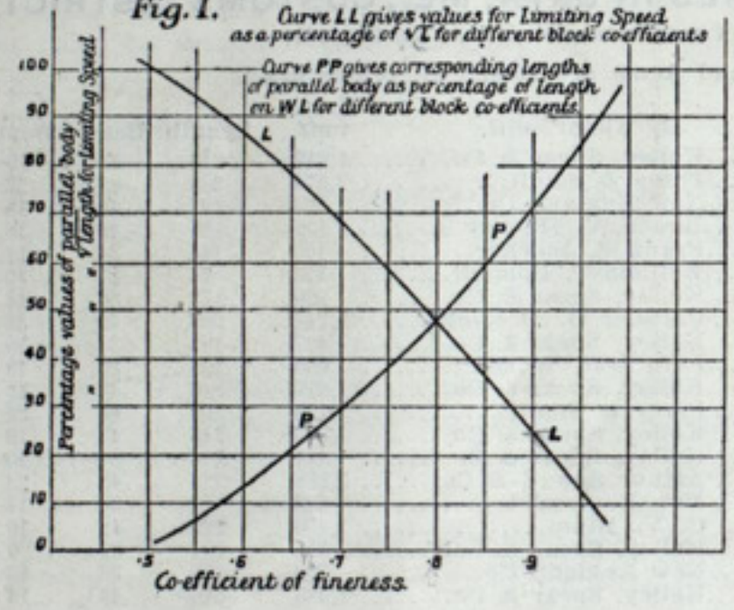


Fig. 3. C1 Curve of values of $\frac{D^{\frac{2}{3}}v^3}{I.H.P.}$ at limiting speed. C2 " " " " when skin H.P. = wave H.P.

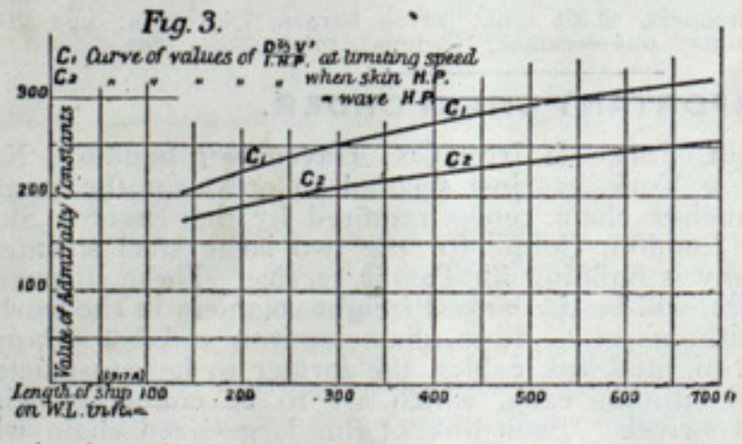
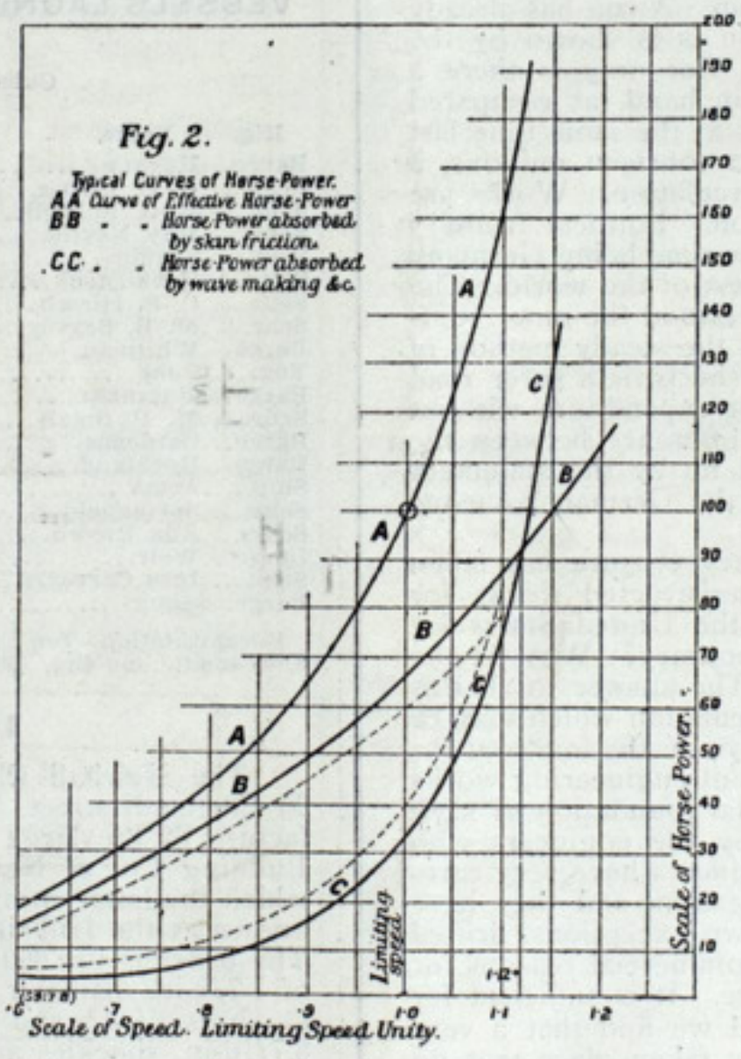


Fig. 2. Typical Curves of Horse-Power. A A Curve of Effective Horse-Power. B B " " Horse Power absorbed by skin friction. C C " " Horse-Power absorbed by wave making &c.



caused by minor projections and irregularities in the surface of the smaller ships, these irregularities being on a proportionately larger scale in the smaller than in the larger vessel. It must also be borne in mind that any roughness of sea or wind has a greater effect in proportion on the smaller ships, tending to spoil their performances on trial, as compared with those of larger ships.

I do not intend, when I use the term "economical" speed, to make it include the financial side of the question; as it frequently happens that it is cheaper to increase horse power, to get a little extra speed when required, than to increase the length of the ship, or to fine her lines. What I intend to convey is that, if a speed be aimed at, slightly above the limiting speed I have defined, with the indicated horse power increasing as more than the fourth power of the speed, it will be found possible to drive at that speed, with the same horse power, a vessel increased in one dimension, viz., in length, and proportionally increased in displacement. Whilst, if a still higher speed be aimed at, the vessel may be increased in two dimensions, viz., length and draught, or length and beam, and still attain the higher speed, with the same horse power as the smaller ship. Finally, as was proved by the late Mr. Froude, when the indicated horse power is increasing as the seventh power of the speed, it is possible to drive a similar ship, increased in all three dimensions, at the same speed, with the same horse power as the smaller vessel, and this is more than borne out by the facts.

I have shown that the indicated horse power is usually increasing at this rate, viz., as v^7, when skin horse power = wave horse power, or at about 12 per cent. above the limiting speed. This is then the speed at which it becomes economical to increase all the dimensions of the ship in the same proportion; of course, from the point of view of driving the greatest displacement at the given speed.

There are many vessels in which this limiting speed is far exceeded, such as fast cross-channel passenger vessels, torpedo gunboats and destroyers; but these type are for very special requirements, and are not economical in the sense of carrying large displacement at the required speed. They are not, therefore, included in the scope of this paper. Nor do the figures I have given apply to vessels of very great beam in proportion to their length. The examples I have taken are all of ordinary proportions, not less than 6½ beams in length, and of ordinary draughts; but, as this includes practically all mercantile vessels, and also cruisers of the usual dimensions, the range is fairly wide. In these two latter classes the number of indicated horse power per ton of displacement rarely exceeds two. In the slower vessels of the mercantile marine it goes as low as ¼ indicated horse power per ton of displacement. In the torpedo boat destroyers it goes as high as 20, and in the Viper, with the turbine machinery, has, I understand, reached about 30. So that the exclusion of these very fast craft from a paper dealing with the economical side of the speed and horse power problem is obviously reasonable. The very broad vessels, also to some extent abnormal, have therefore been excluded, as have also the performances of paddle-boats. As regards the comparative performances of single and twin screw vessels, there appears to be little difference in vessels of good form.

Reverting to the limiting economical speed as defined, I find that, generally, for 1 per cent. increase above this limit of speed, 5 per cent. increase of horse power is necessary; and at the speed when skin horse power equals wave horse power, or about 12 per cent. above the limiting speed, 1 per cent. increase of speed requires 10 per cent. increase of power. Taking these figures, it appears to me that any increase of speed above the limits indicated should be most carefully weighed before adopting it, in view of the disproportionate increase in power and weight of machinery thereby rendered necessary, together with increased engine room staff, the larger coal bill, and the reduced weight and capacity for cargo. I think there are ships that might well have been made finer, or have had their speed and power reduced when in the design stage, at the cost of foregoing that last half knot, which possibly requires from 20 to 25 per cent. additional horse power, enabling the vessel, perhaps, to steam a distance of 12 knots farther in twenty-four hours at the cost of burning out coal which would keep her a whole extra day at sea at half a knot less speed, and this without taking into account the original saving in weight and cost of machinery which might have been made.

In conclusion, I would say that I have had great difficulty in obtaining reliable data of progressive trials of ships with very large coefficients of fineness. In these vessels, usually, no progressive trials are made, and, in any trial that does take place, frequently the propellers are only partially submerged.

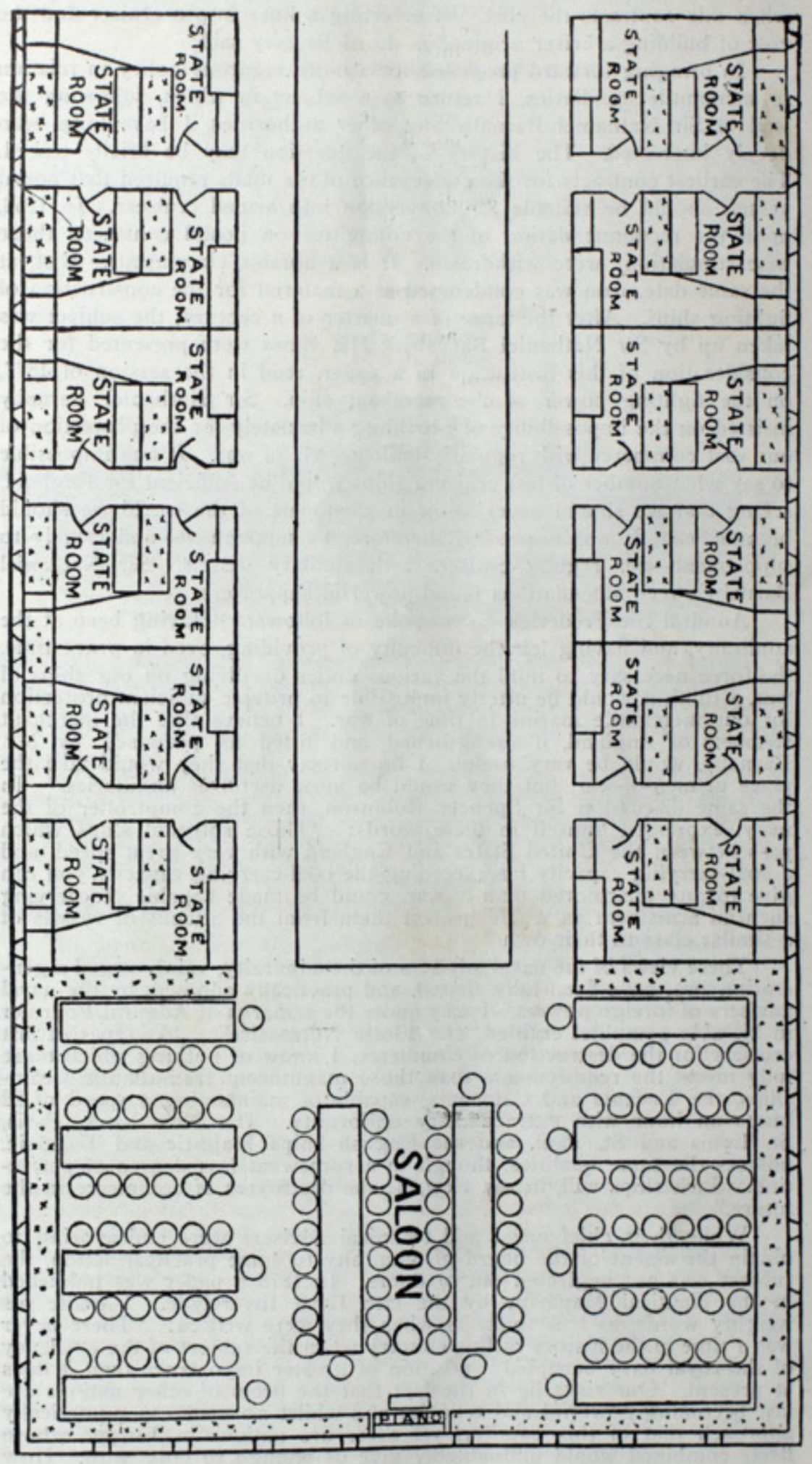
WHEN ENTERING BUFFALO.

Com'dr Dunlap, inspector of the tenth light-house district, reports that there have been some complaints of late that the fog signal in Buffalo harbor is not sounded when the conditions of the atmosphere require its operation. Investigation of these reports shows that the dark background of the south shore of Lake Erie near Buffalo often makes it difficult for the keeper in charge of the fog-signal to discriminate between the hills on the shore and dark clouds of smoke which sometimes settle over the lake in that direction. Vessel masters entering or leaving Buffalo harbor in thick or smoky weather and needing but not getting the assistance of the fog signal, are requested to sound their own whistles frequently, and in such cases the keeper having charge of the fog-signal will at once begin to sound the bell and make immediate preparations to get the fog-signal in operation as soon as possible. The conditions referred to above do not frequently occur, but if vessel masters will heed this request of the inspector, he believes there will be no further cause for complaint.

The Oceanic Steamship Co. is experiencing considerable difficulty in connection with its service between San Francisco and Sydney. The Sonoma was delayed in Port Jackson eight days after her sailing date, having to be docked for repairs, and the next incoming sister, the Ventura, was not allowed to discharge cargo at the Sydney wharves, owing to a reported case of plague in San Francisco. The fact that the reported case had not developed at the time the Ventura left made no difference to the health authorities. In point of fact the case had never developed at all. Considerable indignation over the action of the health authorities was expressed in Australian shipping and maritime circles.

ABOLITION OF THE INSIDE STATEROOM.

Mr. A. W. Bibby of the Bibby line, and chairman of the Pacific Steam Navigation Co., has solved the vexed problem of the inside stateroom. On long voyages, and particularly on vessels which have to pass through tropical waters, the inside stateroom is undesirable. It is difficult to light and ventilate it and it has no communication with the side of the ship. A system has been devised by Mr. Bibby by which the inside stateroom has been done away with. Mr. Bibby has invented the tandem stateroom. So simple is the arrangement, and at the same time so effective, that it is remarkable that a system which confers such benefits was not put into operation long ago. The illustration clearly explains the arrangement. At right angles to the main alleyways are passages common to four staterooms, two on either side, while in each passage is a porthole. Leading



into the passage are the stateroom doors. In this tandem arrangement one stateroom has a porthole in its widest part, while the other has a porthole (under which is a comfortable seat) in its narrowest part. Thus both cabins enjoy the advantages of direct communication with the side of the ship and hence the obnoxious inside stateroom is abolished. The evolution of this simple and effective method of equalizing the berthing accommodation on shipboard is interesting. The first tandem stateroom was built from Mr. Bibby's designs by Messrs. Harland & Wolff of Belfast, Ireland, at whose famous yard the whole of the Bibby fleet has been constructed. When the model was completed its utility was manifested at once. It is now being applied to steamers building at the Harland & Wolff works and at the Fairfield Co.'s yards in England. Steamers of the British mail service are also being equipped with this ingenious arrangement of staterooms.

MERCANTILE AUXILIARIES.

LORD BRASSEY FAVORS THE ADOPTION OF A DEFINITE POLICY LOOKING TO THE CONVERSION OF OCEAN LINERS INTO AUXILIARY CRUISERS.

Lord Brassey, one of the most distinguished of naval authorities, addressed the Institution of Naval Architects in Glasgow recently upon the subject of "Mercantile Auxiliaries." He is decidedly in favor of the conversion of ocean liners into auxiliary cruisers—a policy which was adopted by the United States during the war with Spain. He favors also a definite annual allowance in the naval bill for this purpose and claims that even the most liberal appropriation would be economy—particularly when one contrasts the cost of converting a liner into a cruiser and the cost of building a criser originally. Lord Brassey said:

In bringing forward proposals for a more vigorous policy in relation to mercantile auxiliaries, I return to a subject in which, following the lead of Sir Nathaniel Barnaby and other authorities, I have long been deeply interested. The history of the question may be briefly traced. The earliest contracts for the conveyance of the mails required that postal vessels should be suitable for conversion into armed cruisers. In 1853, upon the recommendation of the committee on postal contracts, those wise stipulations were withdrawn. It is a notable circumstance that, at the same date, iron was condemned as a material for the construction of fighting ships. After the lapse of a quarter of a century, the subject was taken up by Sir Nathaniel Barnaby. His views were presented for the consideration of this institution in a paper, read in the session of 1877, on the fighting power of the merchant ship. Sir Nathaniel Barnaby insisted on the impossibility of providing adequately for the protection of our vast commerce with regularly-built vessels of war. It was impossible to say what number of fast cruising ships would be sufficient for England, seeing that we should never know in what part of the world we should be attacked. It was necessary, therefore, to supplement—and largely to supplement—our regular cruisers with auxilary vessels. Sir Nathaniel Barnaby's recommendations found powerful supporters.

Admiral Sir Frederick Gray spoke as follows: "Having been at the admiralty, and having felt the difficulty of providing, even in peace time, the force necessary to fulfil the various duties devolving on our ships of war, I think it would be utterly impossible to provide sufficient protection for our mercantile marine in time of war. I believe that the merchant steamers of England, if strengthened and fitted as proposed by Mr. Barnaby, would be very useful. I do not say that they would take the place of men-of-war, but they would be most useful as auxiliaries." In the same discussion Sir Spencer Robinson, then the comptroller of the navy, expressed himself in these words: "Those splendid ships which pass between the United States and England with very great speed, and a coal-carrying capacity far exceeding the coal-carrying capacity you can give to any unarmored man-of-war, could be made capable of carrying such an armament as would protect them from the attacks of vessels of a similar class to their own."

These views of the naval advisers of the admiralty, vainly urged a generation ago, have been fully shared, and practically adopted, by the naval advisers of foreign powers. I may quote the remarks of Admiral Fournier in his able pamphlet entitled, "La Flotte Nécessaire": "As types of fast cruisers for the destruction of commerce, I know of nothing which more fully meets the requirements than those magnificent transatlantic steamships, the Lucania and Campania, capable of maintaining a speed of 22 knots an hour with extraordinary uniformity. The New York, Paris, St. Louis and St. Paul, and the English ships Majestic and Teutonic, possess the same qualities, though in a somewhat less degree of perfection. Such ships will, in my view, be the destroyers of commerce in the future."

While their chief naval and technical advisers were endeavoring to obtain the assent of the board of admiralty to some practical action, the subject was not neglected out of doors. In 1878 a paper was published in the Nautical Magazine by the late Lord Inverclyde. I quote his weighty words, as true today as when they were written: "There never was a time in the history of this country when the subject of the efficiency of the royal navy occupied a position of greater importance than it does at present. Our risks lie in the fact that the fleets of other nations are fast becoming powerful and reliable; and whilst no navy can numerically approach that of this country, yet there are nations in Europe whose fleets combined would undoubtedly give us enough to cope with. How then can we stride ahead as the greatest maritime power, and hold our own against the fleets of the world? Not by being satisfied with increasing the strength of the navy proper, which, owing to the prodigious cost of modern war vessels, can only be done in a comparatively small degree. But what cannot be accomplished in this direction can be attained by other means ready to our hand, and that by utilising the vessels of the mercantile marine."

INCREASE IN COST OF CRUISERS.

At the date of Lord Inverclyde's paper the cost of our most powerful cruisers was under a quarter of a million. The cost of the first-class cruisers we are now building is more than threefold greater. The practical steps which Lord Inverclyde recommended to the admiralty are briefly described in his paper. There was wanted a scheme by which the advantages of the vast fleet of merchant steamers now belonging to the country should be conserved for our special requirements, and it was due to our naval authorities to admit that they had recognized that there were numerous British vessels which could easily be converted into cruisers. There was, however, one fatal flaw in the admiralty plan—they wanted to have the use of the ships without paying an adequate consideration. As Lord Inverclyde put it: "It was not to be supposed that a position for their vessels on the select list would be a sufficient inducement to comply with admiralty requirements, and to incur the expense involved in exacting the requisite alterations. War being only a contingency more or less remote, a retaining fee must be offered." It was proposed by Lord Inverclyde that subsidised steamers should be built to meet certain requirements, including increased bulkheads and watertight compartments. The ships should be manned by seamen of the Royal Naval Rerserve, who should be thoroughly trained in gunnery at the respective home ports of the companies or owners.

The subject of mercantile auxiliaries continued to attract the attention of our highest authorities on naval administration. In 1880 Sir Donald Currie read an exhaustive paper at the United Service Institution. He referred to the general increase in naval preparations. France had increased her navy; Germany and Russia were making large strides in the direction of more powerful naval forces. Quite recently the Russian volunteer fleet had been originated by Prince Dolgorouki, the governor-general of Moscow. He addressed himself to the wealthy merchants of that ancient capital, appealing to their patriotism, and a Volunteer cruisers' fund had been raised. Sir Donald Currie submitted a scheme for the retention of swift merchant cruisers by an annual subsidy. I may refer to another ship owner, most eminent in that branch of enterprise with which he was connected. I refer to the late Mr. Ismay. In the evidence which he gave before the royal commission on coaling stations he truly said: "When a company has not been doing well, and has got heavy bills running which it cannot meet, the temptation to shut its eyes to what would be the ultimate designation of ships sold to foreigners in a crisis would be very great. At the commencement of the Russian scare, on the occasion of the Penjdeh incident, great temptations were offered to the owners of the White Star steamers running between San Francisco and Japan; and it was not too much to say that our whole commerce in the Pacific would have been transferred to the flag of the United States if that offer had been accepted." The British ownership of a magnificent steamship is a slight national tie. It binds to no national service while it exists, and it may be broken without warning at the will of the owners. These considerations may be pleaded as a strong argument in support of the policy of binding all our finest vessels to the service of the state as mercantile auxiliaries.

Passing on to the later authorities, the practicability of so constructing merchant steamers as to render them readily available for war purposes was discussed by Mr. Biles in a paper read at an engineering conference, held under the auspices of the Institution of Civil Engineers in June, 1899. Arguing from the results of arming and fighting the mercantile cruisers of the United States navy, Mr. Biles takes the view that such vessels are not unable to cope with thoroughbred warships. The experiences of modern sea fights point to the conclusion that a ship is more liable to be disabled by her crew being driven from their guns than to be sunk by the effects of shell-fire. The issue of a fight between a war ship and a merchant ship may not turn on the relative efficiency of the internal subdivision, but on the protection of the guns. By placing the guns in a box battery, as the Americans did, a considerable number of guns could be as well protected in merchant ships as in first-class cruisers. Mr. Biles holds it to be practicable, with due consideration in the early stages of design and construction, to so protect machinery and armament that the merchant ship need not be much, if at all, inferior to many warships.

ADVANTAGE OF LIBERAL SUBSIDIES.

The policy of liberal subsidies to the mercantile marine has given to the merchant navies of foreign powers a decided advantage in the possession of the types of vessels most suitable for naval purposes. The Germans have taken the lead. They have two ships now running—the Deutschland and the Kaiser Wilhelm of 14,000 tons and 15,000 tons respectively—which exceed in speed by nearly two knots our best ships. No vessel now building for the British flag will rival in speed the Kaiser Wilhelm II and Kronprinz Wilhelm, under construction in Germany. Of ships capable of a regular sea speed of over 18 knots, France has four, Germany eight, and Great Britain ten. Taking vessels above 3,000 tons only, Lloyd's statistics, as quoted by Mr. Biles, give the relative positions as follows:

	British.	Foreign.
20 knots and over	6	6
19 to 20 knots	1	11
18 to 19 knots	9	4
17 to 18 knots	22	18
16 to 17 knots	17	18
	55	57

It is an ominous fact that in the last eight years we have added only one ocean-going 18-knot ship to our navy, while Germany has built four in the last four years. It is another ominous fact that, while we equal the combined merchant navies of the world in aggregate tonnage, of the 157 ships of 16 knots and over less than one-half the number are under the British flag. If we examine the lists of mercantile auxiliaries of the several powers, we find that France has thirty-two vessels, the latest additions, the Lorraine and Savoie, having a displacement of over 11,000 tons. The speeds of the French subsidized steamers have been constantly increasing from the 15 knots of twenty years ago to the 17, 18 and 19 knots of modern types. The armaments provided for each ship include seven 5.5-in. guns and smaller quick-firers. In numbers the German auxiliaries do not compare with the French. There are, however, six ships of the first class, which, as has already been observed, hold the record in the international competition on the North Atlantic. The armaments prepared for the German mercantile auxiliaries include eight 5-in. guns, four 4.7-in., four smaller quick-firers, and fourteen machine guns. The Russian fleet of auxiliary steamers consists of twenty-five vessels. In displacement each of these ships exceeds 10,000 tons, with speeds of 19½ to 20 knots. The British list of reserve merchant cruisers compares unfavorably with those of foreign powers. It consists of twenty-nine vessels, none being fitted with special protective arrangements.

With these comparisons before us, we must regret that so little heed should have been paid to the counsels of the able men to whom I referred in the opening of this paper; how little is attested by the fact that the amount payable to the owners of our reserve merchant cruisers under the naval estimates now before parliament is £63,000 out of a total of £2,000,000 which parliament is asked to vote for the navy. While we have taken no adequate measures to create a fleet of mercantile

auxiliaries by the appropriation of moneys directly voted from navy estimates, we have been sparing in our grants for postal services. The amounts paid have been computed by Mr. Henniker-Heaton, member of parliament, as follows:

Countries.	Money.	Total value of the foreign trade.
France	£1,143,000	£300,000,000
Germany	1,000,000	313,000,000
Russia	251,000	111,000,000
Italy	400,000	182,000,000
Great Britain	637,000	750,000,000

Now let us ask ourselves what steps it is practicable to take in furtherance of the policy which it has been the object of the present paper to recommend. First, what is the proper sphere of action of the mercantile auxiliary? It was described by Lord George Hamilton in moving the navy estimates for 1889. They would be employed in dogging the footsteps of a foreign rover and embarrassing a foe; they would act as the scouts of the fleet. The difficulty of keeping touch with a squadron has been strongly impressed in recent maneuvers. As scouts and patrol vessels, their long coal endurance would give to the mercantile auxiliaries an advantage over regularly-built vessels of war of even tonnage. Such being the role of the mercantile auxiliary, the qualities required are speed, coal endurance, internal subdivision up to admiralty requirements, strength of hull. Guns must be carried at such a height above water as to be of service in a seaway. Lastly, there is the absolute requirement of protection from the shot and highly-explosive shell of quick-firing guns. The power of modern armaments to reduce unarmored superstructures to wreckage, to disable guns, and annihilate guns' crews has been signally shown in the battles of Manila and Santiago.

AN EXCELLENT SUBSIDY ARGUMENT.

If the requirements were carefully considered in the original design, it would be possible to give as much, or nearly as much, protection to the mercantile auxiliary as to the regularly-built cruiser. Mr. Peskett of the Cunard Co. has recently offered some practical suggestions on this subject in a lecture delivered at Liverpool. Mr. Peskett is a strong advocate for subsidies to mercantile auxiliaries, conditional upon the adaptation of the ships to the requirement of naval warfare. I may quote from a précis of his lecture:

"Merchant ships of the Campania or Saxonia class could actually be built lighter than they are under the present system if they were built with one very strong deck, such as a protective deck with sloping sides, or with a deck of cellular form. The disposition of material in some of our large steamers is not, perhaps, in strict accordance with the best designs our naval architects could produce, but entirely due to the requirements of owners and the various registration societies. I should say that a cruiser's hull with protective deck is lighter in proportion to her displacement than that of many of our first-class passenger steamers. Taking into consideration the fact that our supremacy depends on the efficiency of our naval and mercantile marine, a committee of admiralty officials, ship owners, and ship builders should be formed to discuss the best method of constructing a combined naval and mercantile marine, and to consider whether ships could be built as merchant cruisers, with protective decks, ram stems, machinery, and steering gear below the water-line, and still be able to carry enough passengers and mails, which, with a reasonable subsidy, would make the ships remunerative to owners. These ships would have to be permanently mounted with light guns, racer plates for heavier armaments being built in the ships during construction, the heavier guns and mountings being kept at ports of call, and made to suit the various ships of any particular fleet."

It has always been recognized that mercantile auxiliaries cannot be effective unless specially designed for conversion into cruisers. In the discussion at the Institute of Naval Architects on Mr. Barnaby's paper already referred to, Sir Edward Reed proposed that ship owners about to build large and swift merchant vessels should be invited to submit their plans to the admiralty. The cost of any alterations which they might be willing to make in order to adapt these vessels for the emergency of war service should be met by a grant from the government.

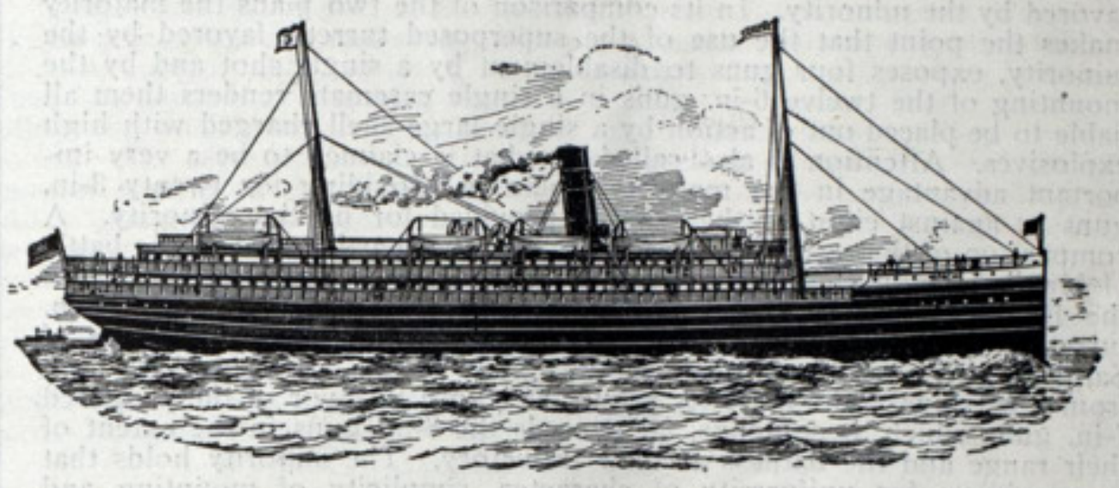
PROTECTION TO COMMERCE IS VITAL.

It is the main object of the present paper to urge the adoption of valuable and practical recommendations, which have been too long neglected. It is the fixed resolve of the people, and, perhaps, the first duty of British statesmen, to keep the empire secure from attack, and to give protection to the commerce on which our existence depends. In pursuance of this policy we have more than doubled the expenditure under naval estimates, and still we seem to fall short of the full requirements for the naval defense of the empire. It would be impossible to fix a limit to the number of cruisers required for the protection of a commerce which extends over every sea. The construction of cruisers has absorbed in recent years a large proportion of the ship building votes. But when the cost of the first-class types falls little short of that of the battleship the numbers we can build are all too few for the work they might be required to do. We cannot cut down the expenditure on battleships. If, therefore, our regular-built cruisers are fewer than we could wish we must look to our mercantile marine and out of the abundant materials we there find ready to our hands we may organize a supplemental fleet of armed cruisers such as no other state can furnish. The admiralty should utilize these resources by liberal subsidies. The standard of requirements should be high. The speed should not be less than that of the Deutschland—let us say 22 knots at sea. Mercantile auxiliaries should be protected by a deck or belt of Harveyized armor—the necessary armaments should be in readiness. Calculations of cost can hardly be attempted in a paper in which nothing more is attempted beyond suggesting a policy. It is at least certain that the cost of the adaptations and protective arrangements necessary in a mercantile auxiliary will be small in comparison with the first cost of a regularly-built vessel of war. For a first-class cruiser we may take the cost at three quarters of a million. Allowing 3½ per cent. on the money invested, adding 6 per cent. for depreciation and 1 per cent. for insurance we have in round figures for the first cost an annual writing down of £70,000 per year. In addition there is the cost of maintenance, which, whether in commission or in reserve will certainly be considerable. Allowing for the protective arrangements of the mercantile auxiliary the liberal sum of £50,000 and a writing down charge on this amount of 10 per cent., and taking 10s. per ton displacement for the annual retainer, we have for a mercantile cruiser of 10,000 tons an annual charge of £10,000. We must further take into view the economy resulting from the maintenance of the mercantile auxiliary by the ship owners as against the maintenance of the man-of-war in our royal yards.

In conclusion I claim it has been clearly shown that we can have many auxiliaries for the cost of one cruiser; and these auxiliaries may have effective protection. If not equal to the ship of war as combatants they will be superior in coal endurance and probably speed for long distances. They would be the scouts of our fighting squadrons. They would protect our commerce from interruption by the auxiliary vessels of a hostile power. While the building of cruisers for the navy should be continued the resources we possess in the marine, which our maritime enterprise has created in extent practically without limit, should not be neglected. If the expenditure on auxiliary cruisers were raised from £60,000 to £600,000 a year, in a few years we should be enabled to provide no ineffective protection for our vast trade.

CLYDE LINE STEAMER APACHE.

The Apache, one of the new steamers of the Clyde line, which is now operating some fifteen or sixteen large steamers between principal ports on the Atlantic seaboard, is illustrated herewith. This vessel is the latest addition to the Clyde fleet. She is in service between New York, Charleston and Jacksonville. A sister ship, the Arapahoe, is nearing completion and will be in service shortly. The Apache was built by the Cramps of Philadelphia. She is 310 ft. long, 46 ft. wide, and 31 ft. deep, and has a speed of 15 knots, with a capacity for 3,000 tons of cargo. The vessel is



admirably arranged and handsomely decorated. Her accommodations for over 200 passengers are located entirely above the upper deck, thus insuring the best of light and ventilation at all times. She is lighted throughout by electricity, and her fittings and equipment are up to the highest standard.

The Clyde Steamship Co. serves with regular lines the ports of Boston, Providence, New York, Philadelphia, Norfolk, Richmond, Wilmington, N. C., Georgetown, S. C., Brunswick, Ga., and Jacksonville, Fla.; operating also a regular line of mail steamers between New York, Turks island and Santo Domingo.

RECOVERY OF BY-PRODUCTS IN CHARCOAL BURNING.

The manufacture of charcoal iron long ago lost the importance which it had in the early days of the iron industry, but that class of pig iron being still desirable for certain purposes its production is continued on a comparatively small scale in some districts where cheap charcoal is yet available. The charcoal that is required has been made hitherto chiefly by the charring of wood in heaps, pits and beehive ovens, although the Cleveland-Cliffs Iron Co. of Gladstone, Mich., has been for some time employing successfully the modern and more scientific method of distilling the wood in externally heated retorts. It has been reported recently that some other charcoal iron manufacturers of Michigan have decided upon adopting the same method, which is contemplated also for the manufacture of charcoal at Sault Ste. Marie, Ont., in connection with the gigantic industrial scheme which is now being carried out at that place.

The manufacture of charcoal by the distillation of wood in retorts is analogous to the coking of coal in by-product ovens, the volatile matter in each case being distilled off and collected instead of being wasted, as it is from the ordinary beehive ovens. The distillation of wood yields a tarry product and an aqueous, acid vapor containing various valuable substances, which can be condensed, and a noncondensible, combustible gas, which can be burned around the retorts, affording a part of the heat which is required to effect the distillation. The tar is valuable as a source of creosote and other compounds which are analogous to those obtainable from coal tar. The pyroligneous acid, so-called, yields by fractional distillation crude methyl alcohol and acetic acid. The latter is commonly neutralized with lime, forming impure calcium acetate, which is more convenient for storage and shipment than the acid itself. The commercial standard for "gray acetate of lime" is a tenor of 86 per cent. calcium acetate. Besides these by-products, wood distilled in retorts yields generally a higher percentage of charcoal, which is likely moreover to be of a better quality than that which is obtained from the old beehive ovens, wherein the temperature and other conditions are less perfectly under control. The yield of the various products varies greatly according to the kind of wood distilled and the temperature and other conditions of the distillation; but even under unfavorable circumstances the value of the alcohol and acetate of lime is likely to be greater than that of the charcoal; wherefore there is ample incentive to discard the antiquated method which wastes the constituents of the wood from which those substances are obtainable. At the present time prices for both crude wood alcohol and gray acetate of lime are low, and estimates which are based on the present market ought to be reasonably safe.—Engineering & Mining Journal.

ARMAMENT OF NEW BATTLESHIPS.

THE MAJORITY OF THE NAVAL BOARD OF CONSTRUCTION IS OPPOSED TO THE SUPERPOSED TURRET—ADMIRAL BRADFORD FAVORS THE SUPERPOSED SYSTEM IN A VIGOROUS REPORT.

It was announced in the Review last week that the majority of the naval board of construction had decided upon single turrets for the armament of the new battleships. The plans of the battleships submitted are as follows: Length, 450 ft.; beam, 76 ft.; mean draught, 24 ft. 6. in.; displacement, 15,560 tons. This displacement will give a ship considerably larger than anything in the present navy. The hull alone will weigh about 7,000 tons, while the protective armor will weigh about 3,700 tons. The total coal capacity will be about 2,000 tons; total load displacement, 16,900; deep load draught, 26 ft. 4 in.; speed 19 knots with an indicated horse power of 20,000. The battery recommended by the majority is to consist of four 12-in. guns in two 10-in. armored turrets, twenty 7-in. guns in casemates and twenty 3-in. guns. Eight of the 7-in. guns are enclosed in individual armor, four on the upper deck and four on the gun deck, firing ahead and astern. The remaining twelve guns are located on the gun deck in a central casemate battery. The machinery is protected by a 10-in. armor belt, tapering to 4 in. fore-and-aft beyond the machinery space, and the other protection consists of armor 7 and 6 in. think, except the 12-in. turrets where it is 10 in. thick. The majority are opposed to the further use of the superposed turrets and they recommend a uniform caliber of 7 in. for what may be termed the auxiliary battery in preference to a mixed battery of 8-in. and 6-in. guns, favored by the minority. In its comparison of the two plans the majority makes the point that the use of the superposed turrets, favored by the minority, exposes four guns to disablement by a single shot and by the mounting of the twelve 6-in. guns in a single casemate renders them all liable to be placed out of action by a single large shell charged with high explosives. Attention is also called to what is claimed to be a very important advantage in the majority's plan in providing for twenty 3-in. guns as against eight of that caliber provided for by the minority. A comparison of the results of the fire of ships that participated in the battle of Manila is submitted to show that 8-in. guns not mounted in turrets on the Baltimore and Boston gave greater rapidity of fire than the 8-in. turret guns of the Olympia. It is contended also that at the battle of Santiago there were only thirteen hits made by the 319 projectiles fired from 8-in. guns. The majority argues at length in favor of the proposed 7-in. guns which, it contends, far exceeds the 8-in. guns in the extent of their range and the flatness of their trajectory. The majority holds that in providing for uniformity of character, simplicity of mounting and separation of guns it has presented a vessel more powerful than any yet built or projected by any power. A table is submitted to show that the twenty 7-in. guns of the majority plan will throw 4,125 lbs. of metal a minute from each broadside and that the twelve 8-in. and twelve 6-in. guns provided by the minority while capable of throwing 4,500 lbs. of metal a minute from one broadside can only throw about 3,300 lbs. of metal a minute from the other broadside. All the main battery guns, except the 12-in. of the majority's ship, will throw 8,250 lbs. of metal in a minute, while all the main battery guns except the 12-in. of the minority's ship will throw 7,800 lbs. of metal in a minute.

Rear Admiral Bradford, chief of the bureau of equipment, who submits the minority report goes into the relative merits of both batteries and does not hesitate to criticize the majority battery as weak. He asserts that the Alabama and Maine types, which have armaments similar to the majority ship, have weak batteries. As for the 7-in. gun advocated by the majority, he says there is no such gun in existence and the calculations as to its power are merely theoretical.

The battery advocated by Admiral Bradford consists of the two 12-in. turrets with two 8-in. turrets superposed on them, and four additional 8-in. turrets arranged in the form of a quadrilateral. There are in addition, on the main deck, twelve 6-in. rapid-fire guns. The entire battery consists of twenty-eight guns, divided as follows: Four twelves, twelve eights, and twelve sixes. The battery of the majority (Rear Admirals O'Neil, Melville and Bowles) has no 8-in. guns and no superposed turrets. It consists of four twelves in two turrets and twenty sevens (none protected by turrets), the latter being located, as described by Admiral Bradford, as follows: "Sixteen on the main deck behind casemate armor, arranged largely in accordance with the battery on an old frigate's gun deck; on the deck above, at the corners of the superstructure, are installed four more 7-in. guns for the purpose of increasing the fire ahead and astern."

Admiral Bradford says that the absence of turret protection and the reduction in caliber are marked features of the majority design "to which officers have heretofore shown a marked disapproval." He adds that the maximum broadside fire of the 7-in. battery (in the majority design) extends over an arc of only 64°, with an average muzzle energy of 230,620 foot-tons over that arc, while in the minority's type it extends over an arc of 90°, with an average muzzle energy of 253,174 foot-tons, both vessels assumed to be engaged on one side only. He admits that the majority's battery is able to deliver at the same time the same energy of fire on both sides, while his battery "can deliver on both sides at the same time, but 220,530 foot-tons, which is a little less than in the case of type 4 [the majority's]." He claims for his battery, however, a great advantage over the majority's in that "it delivers a maximum fire over 100° of arc, while the latter delivers it over only 64°."

"It will thus be seen," he adds, "that type 5 [minority's] will still have the advantage, even while engaged on both sides." Admiral Bradford argues that his battery should be adopted to preserve the homogeneity of the fleet. He says that the majority battery corresponds only with the Alabama and the Maine classes, and does "not hesitate to assert that these ships possess a weak battery, and the omission of 8-in. guns from their armament is much regretted by the best informed officers of the navy." There are six vessels of these classes armed only with 12-in.

and 8-in. guns, the latter in broadside, and there are eleven ships built or building having 8-in. guns mounted in turrets. "To the unprofessional mind it might perhaps appear to be a good plan to build varying types of ships, in order to make sure that some one type shall be the best. This would be a great error, since nothing is worse than a patchwork fleet, some of one kind and others of another. The wisdom of adopting the 8-in. gun as a part of the battery of our battleships has been clearly demonstrated and is being rapidly followed by foreign nations. No reduction in caliber should be entertained."

Admiral Bradford then takes up the important question of superposed turrets. He invites attention to the fact that Admiral O'Neil voted for the armament (including guns in superposed turrets) adopted for the five battleships of the Virginia class, and to the opinion of officers of the Kearsarge and the Kentucky, which have superposed turrets, in favor of that type. "The unfavorable criticisms of the superposed turret are, thus far, purely theoretical," says Admiral Bradford. "In practice they have fulfilled every expectation of their advocates."

Admiral Bradford concurs with the majority as to the general type of ship recommended. In conclusion he says: "The armament of the ships of the Virginia class was assigned only after the most careful consideration by many of the ablest officers of the navy. I consider it very unfortunate that the majority of the board of construction should now recommend an armament for additional battleships so different in caliber and so differently disposed, protected and mounted. The natural effect will be loss of confidence in the knowledge of the board as to the type of battleship best suited for naval purposes. I therefore recommend the most careful consideration by the best authorities the department is able to command."

$13.50 TO ATLANTIC CITY, N. J., AND RETURN.

From any point on C. T. & V. R. R., July 18 and August 15. Tickets good twelve days and for return will admit of stop-over at Washington on return trip. Apply to any agent, or J. E. Galbraith, traffic manager, C. T. & V. R. R., Cleveland, O. Aug. 8.

Within a very short time now the United States hydrographic office will have completed the series of small books containing sailing directions for all parts of the great lakes, and which are being sold at such a low cost—30 cents each—as to place them within reach of all young men who are seeking advancement aboard the vessels. As a private enterprise these books could not be compiled for anything like the cost at which the government issues them. Two books of the series, covering Lakes Superior and Michigan, are already on sale, and another, dealing with Lake Huron, the Straits of Mackinaw, Lake St. Clair and the St. Clair river, will come from the press shortly. The fourth and last of the books, now in course of preparation, will cover the Detroit river and Lakes Erie and Ontario. These "Sailing Directions" may be had from the Marine Review.

WIRELESS TELEGRAPHY IN AFRICA.

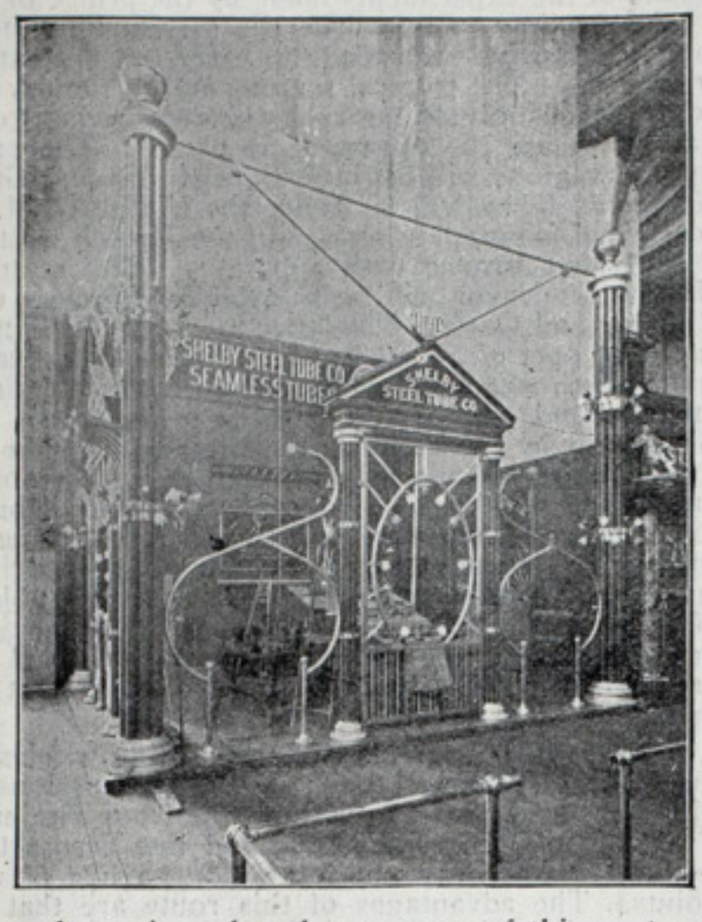
The French government has been encouraged by the helpfulness that the British derived from the wireless telegraph in the Boer war and the results of the experiments made by the prince of Monaco to take steps in a tentative way to introduce the system into the African colonies. Arrangements have been made to carry out the experiments simultaneously both in the moist tropical regions and in the dry Sahara. The work is to be advanced only so far as its success seems to be assured between the stations where the apparatus is placed. The experiments in the moist tropical regions will begin in Senegambia and Gaboon, on the west coast of Africa. They will be under the charge of M. Magne, director of the postal and telegraphic service in the French west coast colonies. He has recently left France with apparatus sufficient to equip several stations. His first endeavor will be to establish wireless communications between Rufisque and Gorée. The latter town is a mile and a half from Dakar, the excellent port of Senegal, where large ocean steamers ride safely in deep and smooth water and where the Atlantic cable from Europe first reaches the mainland. About twenty miles to the east is Rufisque, separated from Gorée only by a water surface. Magne's second experiment will be further south in the still more humid climate of Gaboon where he will test the practicability of the wireless system between Libreville and Denis. These towns, about twenty-five miles apart, are also separated only by a water surface, the purpose being in both these experiments to have the most favorable conditions as to surface and thus be able to study under the best of circumstances the meteorological influences that may determine the practicability of the system in tropical Africa. If wireless telegraphy proves to be a success at these stations the next step will be to extend it inland.

Meanwhile the project of establishing wireless communications across the desert of Sahara is under way. Two missions, equipped with modified Marconi apparatus, are to start, one from Timbuctoo and the other from Tuat, the termini of the proposed line across the desert. They are to follow the usual caravan route along a line of wells, between these two points. The advantages of this route are that it offers a considerable amount of grazing for camels, is far to the west of the hostile Tuaregs, and is inhabited, here and there, by friendly natives, a part of whom will be employed to protect the line if it is put into operation. The two parties are to establish stations along the route, it being, of course, a necessary condition that each station is able to communicate successfully with the one established behind it. The parties will advance only as fast as this end may be attained. If they are successful they will meet in the middle of the desert and wireless telegraphy will have been established across the greatest waste in the world.

Pan-American exposition rates to Buffalo via the Nickel Plate road—Tickets now on sale at all stations, one and one-third fare for round trip, good returning fifteen days. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, Ohio. 85, Aug. 1.

SHELBY STEEL TUBE CO. AT THE PAN-AMERICAN.

One of the most striking as well as one of the most attractive displays at the Pan-American exposition is that of the Shelby Steel Tube Co. The little building is constructed entirely out of the various kinds of tubes manufactured by the company, an idea of which is very cleverly conveyed in the illustration.



CHICAGO-EUROPE SHIP VENTURE.

Both the Northwestern and the Northman of the Northwestern Steamship Co. will sail from Chicago again next week for Europe. While no definite information has been given out regarding the financial result of the initial trip, officials of the company claim to be satisfied. Mr. Charles Counselman, the president of the company, in discussing the route says:

"It is most too early to determine what the outcome of this venture will be. We have had many things not to our liking to contend with in our early experience, but it has been clearly demonstrated that a line of ships can be operated between Chicago and Europe with perfect safety and dispatch. The trouble the steamer Northwestern had with the dredge in the St. Lawrence river surely does not figure against the feasibility of the plan, as such a thing could occur in the Chicago river or anywhere on the great lakes. No doubt it will take a long time to establish the fact with insurance companies that there is no more risk in navigating the rivers and canals to the seaboard than there is in sailing the lakes. If anything prevents the success of the venture it will be the insurance rates. They are now $1.25 per $100 on the cargoes, as against a rate of from 15 to 20 cents from New York to Europe. There is a difference of about $1.40 per ton on high-class provisions from Chicago to Europe compared with the rate charged by the insurance companies from the seaboard to Europe. That in itself would be an excellent profit, and as everything else is rated proportionately high a large part of the profits are eaten up. The companies simply base the excess charge on the risk they assume through the rivers and canals, and with this eliminated the charge should not be more than 50 cents per 100. That would be a fair figure all around, but they do not see it that way, and from the present point of view it does not appear they are going to."

Mr. W. F. Purdy, general manager of the company, writing to the Review upon this subject says: "The company is well satisfied with the Canadian waterway as it exists, for vessels of the size of our ships. However, before this waterway can be much used it must be deepened to allow the passage of boats drawing 18 ft. or more. This company is well satisfied that such a project is feasible, and hopes at an early date to see the commencement of the building of the Georgian Bay canal, which, in our opinion, will be the route for the deep water canal which is bound to come."

The Lidgerwood Manufacturing Co., 96 Liberty street, New York, has received a contract from Russia for a marine cableway for coaling at sea, to be fitted to the battleship Retvizan, now building at the Cramp works, Philadelphia. The railway will be operated by electric motors and the operating winches will be portable so that they can be transported on decks to positions favorable for working the cableway at sea, as well as a plain hoisting device for taking on coal from a collier alongside in the harbor. So equipped the Retvizan will be able to take coal from a sailing ship towed by it, as well as from a steam collier having it in tow.

A particularly useful pump for boiler inspectors, marine engineers and boat owners generally, is that which is made by the Marine Iron Works, station A, Chicago, as illustrated on page 41 of their 1901 catalogue, which is sent free on receipt of request. 7

TRADE NOTES.

Mr. George Bullock of the Bullock Electric Manufacturing Co., Cincinnati, has sailed for England to select a site for the British Bullock plant. The company's foreign business has grown so extensively that it feels that it can care for its foreign trade better by manufacturing there.

Harrison Bros. & Co., Thirty-fifth and Grays Ferry Road, Philadelphia, manufacturers of white lead, colors, paints, varnishes and chemicals, are directing the attention of ship owners, owners of yachts and other craft to their black and white "Weatherproof" enamels for exterior work only. It is claimed for them that they are especially adapted to marine work, as they retain their luster under all weather conditions.

The Universal Safety Tread Co., No. 45 Broadway, New York, has placed upon the market a safety tread that is as safe to walk upon lengthwise of the ridges as transversely. Other treads depend entirely upon the lead to hold the foot. The steel matrix of the universal is in itself a safety tread upon which, even before the introduction of the lead, it would be absolutely impossible for the foot to slip. It is well adapted for decks, passageways and stairways of yachts and vessels of all descriptions.

Plans of the B. F. Sturtevant Co. so far as perfected for its new plant at Hyde Park, Mass., contemplate an engine and electrical shop of gallery type 120 by 400 ft., two buildings each 80 by 400 ft. and three stories high for blowers, heaters, forges, galvanized iron work, exhaust heads, etc., and a foundry 120 by 400 ft. In addition, independent office, power and pattern storage buildings are planned for. Fire-proof or slow-burning construction will be the rule throughout and the fire risk reduced to a minimum.

The Stow Flexible Shaft Co., Twenty-sixth and Callowhill streets, Philadelphia, has issued a catalogue devoted to their portable drills, the making of which they have made a business for the past thirty years. One of the earliest of portable drills was known as the Halsey portable drill. It is still good and of use in some places where nothing else appears to fill the needs. With the invention of the flexible shaft came the next development. The flexible shaft is run by driving rope from countershaft and operates the drill press. There are thousands of them in daily use. The practical use of electricity made another step forward in the use of portable drills. The company makes an electric portable drill. Compressed air added still another kind and the company makes a pneumatic portable drill, using their pneumatic motor, flexible shaft and screw feed drill press. There is very little in the line of a portable drill that the company does not make. It also makes a variety of other tools for reaming, tapping, grinding and polishing.

Low Rate Excursion to New York via B. & O.—Tickets on sale daily until Oct. 20 with privilege of returning via Buffalo. Call at city ticket office, 241 Superior street. Oct. 20.

Low rates to Chicago via B. & O. R. R. July 24, 25 and 26. $8.50 round trip. City ticket office, 241 Superior street, Cleveland. July 25